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ANNUAL REPORT

OF THE

WATER SUPPLY COMMISSION

OF

PENNSYLVANIA

1913

HARRISBURG, PA.:
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1914

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1913

WATER SUPPLY COMMISSION OF PENNSYLVANIA

CHAIRMAN

JOHN BIRKINBINE, Cynwyd, Montgomery County.

VICE CHAIRMAN

FREDERIC W. FLEITZ, Scranton, Lackawanna County.
*BENJAMIN K. FOCHT, Lewisburg, Union County.

SECRETARY

THOMAS J. LYNCH, South Bethlehem, Northampton County.

COMMISSIONER OF FORESTRY

ROBERT S. CONKLIN, Columbia, Lancaster County.

COMMISSIONER OF HEALTH

DR. SAMUEL G. DIXON, Ardmore, Montgomery County.

EMPLOYEES

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Charles E. Ryder.

ENGINEER PYMATUNING RESERVOIR PROJECT

E. E. Haslam.

ASSISTANT ENGINEERS

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George S. Beal.
R. J. Gillis.
C. K. Weigle.
Howard Bronson.
G. S. Weighardt.
T. E. Seelye.

---

*Appointed April 9, 1913, vice Frederic W. Fleitz, resigned.

157976

FLOOD FORECASTER

Ralph H. Hosmer.

HYDROGRAPHER

John D. Reckord.

COMPUTERS

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INSTRUMENT MEN

J. P. Buchanan.
J. L. McAvoy.
C. E. Myers.

DRAFTSMAN

H. T. Munn.

RODMAN

H. C. Wallace.

CHIEF CLERK

William F. Sheridan.

CLERKS AND STENOGRAPHERS

Warren F. Warlow.
C. R. Hinkley.
Charles Matthews.
Wm. M. Burn.
J. J. Speck.
C. C. McLaughlin.

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REPORT

OF THE

WATER SUPPLY COMMISSION OF PENNSYLVANIA

1913

Office of the Water Supply Commission,
Harrisburg, December 31st, 1913.

To His Excellency the Governor of the Commonwealth of Pennsylvania:

To the Members of the Senate and the House of Representatives of the Commonwealth of Pennsylvania:

In compliance with the provisions of the Act of the General Assembly, approved May 4th, 1905, the Water Supply Commission of Pennsylvania respectfully submits its report for the year 1913.

JOHN BIRKINBINE,
Chairman.

BENJAMIN K. FOCHT,
Vice Chairman.

THOMAS J. LYNCH,
Secretary.

ROBERT S. CONKLIN,
Commissioner of Forestry.

SAMUEL G. DIXON,
Commissioner of Health.

◆

CHAPTER I.

NEW LEGISLATION.

The year 1913 was marked by the passage of several important and far-reaching laws relating to the work of the Commission; indeed the most noteworthy legislation affecting its work which has been enacted since the Commission was organized in 1905. It placed upon the Commission duties and responsibilities more extensive and of greater usefulness than all previous laws, and has necessitated an increase in the employees to a force several times that previously engaged, increasing the duties of the members of the Commission correspondingly. Of more importance, however, is the fact that under these laws the Commission is accomplishing valuable results and is able to return to the State benefits commensurate with the responsibilities delegated to it.

Inventory of Water Resources.

For several years the Commission has been collecting data to inform itself of the condition of the water supply of the State, but limited appropriations have required that this be done piecemeal. The Legislature of 1913 enacted the "Inventory Act" (see page 18), which provides funds and the necessary powers to advance this work, so as to determine the extent to which the water resources of the State are now being used and their manner of use. This is essential for determining a policy and plan to follow in future utilization of and supervision over the streams of the Commonwealth. Work under this act was well under way at the close of the year, and the results will be embodied in a special report to be presented to the Legislature of 1915. This law marks an advance by recognizing the great value of the State's waters; and Pennsylvania is, so far as we know, the first state to undertake such a thorough investigation into the streams and their utilization. The recommendations of a Commission, made after the completion of such an inventory, must be authoritative and of immediate and practical value, and we expect that the final report will place this Commonwealth in the lead as to the course it pursues in the future respecting this valuable natural resource.

Dams.

In the 1912 report the Commission sets forth the work which, under orders from the Governor, was done during that year in inspecting dams. Appreciating the necessity for a continuance of this work, the Legislature of 1913 passed an act placing the construction of dams under the control of the Commission, and providing for the investigation of existing dams to determine their safety. The act provides a heavy penalty for failure to comply with orders of the Commission, and empowers it to remove dangerous structures at the owner's expense, if necessary. A discussion of the work done under this act and a copy of the act itself will be found in Chapter III.

Encroachments.

By an act passed in 1907 the Commission was given jurisdiction over encroachments in streams of certain classes, but this lacked a penalty provision and other vital features to assist in its enforcement. The same act of 1913, providing for dam supervision, also includes comprehensive provisions for jurisdiction by the Commission over encroachments along, and over dumping of solid wastes into, the streams; provides a heavy penalty, and includes all streams whose drainage areas are over one-half square mile, except the tidal portion of the Delaware River and of its navigable tributaries, which are controlled by special State and City of Philadelphia boards. A discussion of the work done in 1913 under this act will be found in Chapter III.

Pymatuning Reservoir Project.

In 1911 the Commission received an appropriation to apply to a survey and report upon the feasibility of constructing a reservoir in Pymatuning Swamp, Crawford County, for the purpose of regulating the flow of the Shenango River. This report, published in 1912, indicates this as an attractive and useful project. The Legislature of 1913 enacted a law granting the necessary powers to construct the works, but the appropriation was so limited as to prevent the beginning of construction until further funds were available. It has been necessary during the year to confine work on this project to property surveys, preparation of detail plans and specifications for the construction features, and an accurate estimate of cost. This is such a feasible project, and the conditions in the valley of the stream to be improved have been so thoroughly studied and show such a strong necessity for its early completion, that there should be no hesitation in making provision for its construction. An account of the progress of the work in 1913 and the act of 1913 will be found in Chapter IV.

General Powers.

A law was enacted, and approved July 7, 1913, which gave the Commission power to subpoena witnesses, require the presentation of books and records and other official matters which were deemed necessary, and which previous acts had failed to provide. This act will be found on page 20, at the end of this chapter.

Flood Warning.

Following the flood of March, 1913, which wrought great damage in Ohio and Western Pennsylvania, the Legislature passed an act which directs the Commission to issue warnings to towns along the river valleys, forecasting in advance the coming of floods and their expected maximum height and time of arrival. This work has been organized and the Commission is equipped with the necessary information to give timely warnings of the coming of floods upon the more important streams. A description of the methods employed in flood forecasting will be found in Chapter V, together with a copy of the act.

Construction Work.

Two small pieces of construction work were authorized by the Legislature of 1913. One for the improvement of Sandy Creek and Sandy Lake outlet in Crawford County, to prevent frequent overflow and damage in Sandy Lake Borough by floods, and the other for the completion of dikes at the mouths of two small tributaries of the Delaware River in Bucks County. Construction has not yet been started under the provisions of these acts, although the plans and specifications have been prepared for the Bucks County work. The acts authorizing these works are quoted on page 21.

Discussion.

The Commission is now equipped with power to secure improvement of the water courses of the State, and with appropriations rendering possible the enforcement of its laws in a comprehensive manner. The intention of the Commission is to be reasonable in its requirements regarding the safety of dams and to demand increase in the proportions of such structures within the standards of approved engineering practice. Its purpose is to prevent the erection of structures inherently weak, and to cause to be removed, repaired or strengthened all dams which show indications of possible failure.

Requests have been received for copies of rules or standards covering the design and construction of dams,—the expectation being that the Commission has adopted certain fixed requirements for slopes and widths of embankments, slope paving, size of spillway, proportion of width of base to height of masonry structures, depth to carry excavation for foundations, etc. The Commission believes it is impracticable to establish such rules or standards, because conditions applicable to the design and construction of no two dams are exactly alike; and it favors considering each dam separately, passing upon the plans and specifications on their merits for the locality at which the structure is proposed, and in accordance with local conditions, as applicable to probable run-off, character of foundation, and materials available. The Commission has certain opinions and standards with regard to the design and construction of dams, depending upon the locality and conditions at the site, and endeavors in its analyses and requirements to conform to the rules of established engineering practice, attaining the desired results by insisting upon competent engineering direction for important dams. Many applicants for the approval of dams do not understand the advantage of securing competent advice, and endeavor to save money by employing unskilled assistance. Money spent in competent engineering and through preliminary investigation is usually money saved.

While it is not the desire of the Commission to work hardship upon individuals, corporations, or municipalities presenting applications for legitimate and harmless encroachments, its duty is to stop the former practice of unlimited, uncontrolled and unintelligent restriction of waterways. Therefore it is believed that through a proper dissemination of information concerning the effect of such restrictions, the applications for injurious encroachments will decrease. In our examinations it has been found that the points where greatest restrictions of streams occur are often where the most damage is wrought in flood time, and that where streams pass through congested city districts, overflow causes great losses, the banks have been most extended, the greater number of bridges and piers obstruct the flow, and there the most debris is dumped into the channels and the beds are most raised. Throughout the State stream beds have been encroached upon, and additional ground thus secured without compensating the State and without consideration of injury resulting to other interests. Industries adjacent to creeks and rivers have deposited ashes and other waste so as to reduce the cross section, often at the expense of riparian owners below, when freshets carry this material to points where its lodgment forms bars or reduces the cross section of the stream and causes property damage during floods.

Recommendations.

The advisability of giving to the owners of dams which have been examined and approved by the Commission, or which have been constructed or repaired in accordance with the directions of the Commission, a certificate setting forth its conclusions and opinion, has been given consideration, the practice having been to receive and file the reports upon dams unless alterations are necessary. The Act of June 25, 1913, gives no authority to the Commission to issue a certificate which would allay doubt in the minds of the owners as well as in those of people living below the structures. In the case of existing dams, dependence must be placed upon information furnished the Commission by the owners, builders and designers of the structure, regarding foundations, materials and workmanship; hence the value of the Commission's certificate would be dependent partly upon the authenticity of such information, but as a rule, insecure features of dams are evidenced by external effects or by the design as shown on the plans. If legislative provision is made for periodic inspection of existing dams by the Water Supply Commission and the issuance by it of certificates of approval when the structures are found to be stable, then, as such certificates must be based partly upon information from the owners concerning the manner of construction and materials used, this legislation should require that such information be furnished the Commission by the owners under oath.

The Commission believes that it should receive from the Legislature definite powers to determine and lay out, on plans and on the ground, lines marking the location of river banks through congested districts, so that the stream shall have ample area to discharge anticipated floods with minimum damage, and the Commission should be empowered to cause the removal of existing obstructions which it finds extending beyond such lines. The law now provides ample power to prevent the placing of obstructions beyond such lines. With such an addition to its present powers and duties, and with ample appropriations to properly carry it and the existing statutes into effect, it is believed a lasting benefit will be accomplished.

By the end of 1914 the property surveys, timber estimates, design, and accurate estimate of cost of the Pymatuning Swamp Reservoir project will be completed and submitted, and it is recommended that the Legislature provide an ample appropriation to bring this most advantageous reservoir to early completion.

The Commission has never recommended that the State construct local river bank protective work, but several appropriations have been made for works of this character. In no case has the appropriation been sufficient to make a satisfactory and finished piece of work. It is believed that provision should be made requiring communities which desire aid of this kind to make application to the Water Supply Commission; whereupon surveys would be made, preliminary plans drawn. and the amount of the necessary appropriation determined for the information of the Legislature.

INVENTORY ACT

An Act defining the water resources of the Commonwealth; providing for the taking of an inventory thereof by the Water Supply Commission of Pennsylvania; vesting in said Commission certain powers and duties; providing penalties for violation of this act; and making an appropriation to carry the same into effect.

Whereas, Governor Tener, in his message to the General Assembly, has called attention to the expediency of taking an inventory of the water resources of the Commonwealth, in order that legislation may be enacted to provide for their conservation and utilization under proper State control, in a matter which will best promote the interests of all of the people of the State; therefore,—

Section 1. Be it enacted, &c., That the term "water resources," as used in this act, includes all rivers, streams, and underground waters, and all bodies of surface water, either in whole or in part, within this State.

Section 2. It shall be the duty of the Water Supply Commission of Pennsylvania to make a complete inventory of all the water resources of the Commonwealth; and collect all pertinent data, facts, and information in connection therewith; and to classify, tabulate, record, and preserve the same; and, upon the basis thereof, to determine the points at which reservoirs may be constructed for the purpose of minimizing floods, of storing and conserving water for power, and other utilization and distribution of water and water power, of increasing the low water flow of rivers and streams for the purpose of navigation; and, generally, to devise all possible ways and means to conserve and develop the water supply and water resources of the Commonwealth, for the use of the people thereof. To the end and object aforesaid, the said Commission shall study, consider, and determine upon a public policy with regard to the marketing and equitable distribution of the water to be derived from the water resources of the Commonwealth; to the restoration, development, and improvement of transportation by water; to the supply of water for domestic and industrial use, and to the conservation of water resources by the aid of forestation. The Commission shall present a report, in writing, to the next session of the General Assembly, setting forth the result of such inventory, together with such recommendations and suggestions for legislation, upon the basis thereof, as to it may seem expedient and advisable. The said Commission is hereby authorized and directed to publish, and have printed for general distribution, five thousand copies of such report.

Section 3. The Water Supply Commission of Pennsylvania shall employ such persons, expert or otherwise, as may be needed for the purpose of making the said inventory and report, as aforesaid, and for the purpose of carrying on any and all of its work heretofore authorized, or that may be hereafter authorized, and at such compensation as may be fixed by the said Commission.

Section 4. The Water Supply Commission of Pennsylvania is hereby authorized and empowered to purchase such supplies and material, of any and every kind, as may be incidental to or necessary in the prosecution of its work, if, in its judgment, it is necessary in order to expedite and more efficiently carry on its work.

Section 5. In the performance of the work hereby authorized, the members of the Water Supply Commission, and any agent or employee thereof, are authorized to enter and re-enter upon any land or premises, and may make any survey or measurement, or collect any data deemed necessary. Any person who shall prevent, or attempt to prevent, any such entry or re-entry, or any such work aforesaid, or who shall destroy or deface or disturb any mark, stake, device or apparatus used, or intended to be used, in carrying on said work, shall, upon conviction thereof, in a summary proceeding before any alderman, magistrate or justice of the peace of the county, be sentenced to pay a fine of not more than twenty-five dollars, with costs of prosecution, or, in default thereof, shall be sentenced to undergo an imprisonment in the jail of the county for a period not exceeding ten days.

Section 6. The sum of one hundred fifty thousand dollars, or so much thereof as may be necessary, is hereby specifically appropriated to the Water Supply Commission of Pennsylvania for the purpose of carrying out the provisions of this act.

Section 7. All acts and parts of acts inconsistent with this act are repealed.

Approved—The 25th day of July, A. D. 1913, in the sum of $50,000. I withhold my approval from the remainder of said appropriation because of insufficient State revenue.

JOHN K. TENER.

ENABLING ACT

A Supplement to an act, entitled, "An act creating the Water Supply Commission of Pennsylvania, defining its duties, fixing the scope of its authority and powers, and making an appropriation for the payment of the salaries and expenses connected therewith," approved the fourth day of May, one thousand nine hundred five; and providing penalties for violations of this act.

Section 1. Be it enacted, &c., That the Water Supply Commission of Pennsylvania is hereby authorized to prepare and publish rules and regulations, defining the procedure to be followed in all matters pertaining to or coming within its powers or authority. All hearings shall be public, and the Commission may at its discretion require that notice of any application presented to it, shall be published by the applicants, in at least one newspaper of general circulation in the proper county, two weeks prior to the hearing. Said notice shall include the purpose of the application, names of the applicants, location of the proposed work, and the date of the hearing. Sufficient proof of the publication thereof, shall be filed with the Commission prior to the hearing. The Commission is hereby empowered to subpoena witnesses to appear before it at any time, and to require under subpoena the production of books, papers and records on any matter coming within its powers or authority. Witnesses may be required to testify under oath or affirmation, which may be administered by any member of the Commission; and any person wilfully swearing falsely in any proceeding before the Commission shall be guilty of perjury.

Section 2. Any person who shall appear at any hearing or investigation held by the Commission, who shall refuse to be sworn, or, being sworn, shall refuse to give testimony or produce any documentary evidence in his possession or custody at such hearing or investigation, shall be guilty of a misdemeanor, and upon conviction thereof, shall be sentenced to pay a fine not exceeding five hundred dollars, or undergo an imprisonment in the county jail, not exceeding one year, or both, at the discretion of the court.

Section 3. In the exercise of the powers, or in the performance of the duties now or hereafter conferred or imposed by law on the said Commission, the said Commission, or any of the members thereof, its engineers, employes, or any other agent or person appointed by it, shall have the right to enter and re-enter upon any land or premises, and have free access to the works, structures, buildings or grounds of any person or persons, partnership, association, municipality, township, or corporation, within this Commonwealth, and to make any survey or measurement and collect any data or information which the Commission may deem necessary.

Any person who shall prevent or obstruct, or attempt to prevent or obstruct, the exercise of the right of entry, access or examination aforesaid, shall be guilty of a violation of the provisions of this act, and, upon conviction thereof, in a summary proceeding before any magistrate or justice of the peace of the proper county, shall be sentenced to pay a fine of not less than fifty dollars, nor more than one hundred dollars, or to undergo an imprisonment in the jail of such county for a period not exceeding thirty days.

Section 4. All acts or parts of acts inconsistent herewith are hereby repealed.

Approved—The 7th day of July, A. D., 1913.

JOHN K. TENER.

BUCKS COUNTY DIKE ACT

An act making an appropriation to carry further into operation the provisions of an act, approved the fourteenth day of June, one thousand nine hundred eleven, entitled "An act to authorize the completion of a dike or dikes for the protection of property adjacent to the Delaware River, in Falls Township, Bucks County, and the payment of all monies still due for work heretofore done on the said dike or dikes, and making an appropriation therefor."

Section 1. Be it enacted, &c., That the sum of ten thousand dollars ($10,000), or so much thereof as may be necessary, is hereby specifically appropriated to the Water Supply Commission, in addition to the amount appropriated in the act approved the fourteenth day of June, one thousand nine hundred eleven, entitled "An act to authorize the completion of a dike or dikes for the protection of property adjacent to the Delaware River, in Falls Township, Bucks County, and the payment of all monies still due for work heretofore done on the said dike or dikes, and making an appropriation therefor." This additional appropriation to be used in carrying further into effect the provisions of said act, and towards completing the dike or dikes along the bank of the Delaware River in Falls Township, Bucks County, as therein provided; and for the purpose of paying such monies as are still due for work heretofore done on said dike or dikes as heretofore authorized by law, and as provided for in the fourth section of said act. The monies hereby appropriated shall be paid under the same terms and conditions as the monies appropriated in said act.

Approved—The 25th day of July, A. D. 1913.

JOHN K. TENER.

SANDY CREEK IMPROVEMENT ACT

An act authorizing the Water Supply Commission of Pennsylvania to study the conditions, prepare recommendations, and make certain improvements of Sandy Creek, in Crawford, Mercer, and Venango counties, and of Sandy Lake outlet; and making an appropriation therefor.

Whereas, The borough of Sandy Lake, Mercer County and lands adjacent thereto, are seriously damaged, and the health of the community jeopardized and impaired, by reason of frequently recurring overflows of Sandy Creek and Sandy Lake outlet; and,

Whereas, Said commission has determined that these conditions can be improved by changes in the channel of said streams; therefore,—

Section 1. Be it enacted, &c., That the Water Supply Commission of Pennsylvania is hereby authorized and directed to make a thorough examination of the present utilization and best future development and use of Sandy Creek, and to determine upon plans for carrying the same into effect, with particular reference to the improvement of flood and sanitary conditions at Sandy Lake borough and surrounding territory.

Section 2. Upon the completion of said examination, the said commission is hereby directed to prepare plans and a report and submit the same to the Governor of the Commonwealth; and, if he approves of the same, to proceed with said improvements in accordance with the approved plan.

Section 3. No moneys shall be expended for construction work, or contracts for the same entered into under the provisions of this act, unless and until releases have been obtained from the owners of property abutting on or lying in the channels of Sandy Creek and Sandy Lake outlet, relieving the State from all claims for damage which may be said to result from any work done under this act, and also permitting of the entrance upon said lands for the purposes of examination and construction by the representatives and employes of, or contractors for, the commission.

Section 4. The sum of twelve thousand five hundred dollars ($12,500), or so much thereof as may be necessary, is hereby appropriated for the purpose of making said examination, preparing plans and report, and constructing the work recommended therein; said appropriation to be paid by the State Treasurer on warrants of the Auditor General, on requisition of the Water Supply Commission of Pennsylvania: Provided, however, That no part of the money hereby appropriated shall become available until satisfactory evidence be furnished the Auditor General that the county or counties, municipality or municipalities, immediately affected or benefited by said improvement, shall furnish sufficient money to complete the project.

Approved—The 25th day of July, A. D. 1913, in the sum of $10,000. I withhold my approval from the remainder of said appropriation because of insufficient State revenue.

JOHN K. TENER.

CHAPTER II.

WATER AND WATER POWER COMPANIES.

The Commission approved 21 applications for the incorporation of water and water power companies and 4 agreements of merger in 1913. Engineers experienced in water supply and water power have been added to the force, in connection with the Inventory of the Water Resources, to whom has been delegated the duty of making field examinations and reports, upon applications for the incorporation of new water and water power companies. Exhaustive examinations are made of the plans submitted, of the characteristics of the streams proposed to be used, and of the communities to be supplied. Table No. 1 presents the number of companies incorporated with the approval of the Commission each year since its creation, and the present status thereof:

TABLE NO. 1.

Number of Water and Water Power Companies Incorporated Each Year from May 4, 1905, to December 31, 1913, and Their Present Status.

Year.	Number incorporated.	In Operation.		Under Construction.		Not Operating.	
		Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
1905,	6	4	67	0	0	2	33
1906,	30	21	70	0	0	9	30
1907,	33	21	64	1	3	11	33
1908,	20	12	60	0	0	8	40
1909,	38	26	69	2	5	10	26
1910,	26	21	81	2	8	3	11
1911,	28	18	64	1	4	9	32
1912,	36	14	39	0	0	22	61
1913,	25	18	72	1	4	6	24
Total and equivalent per cent.,	242	155	64	7	3	80	33

The number of companies formed in 1913 was less than in any year except 1908, when the financial panic decreased their rate of organization. In recent years many of the new charters applied for are for permission to supply water to real estate developments, and as progress along this line has been restricted during 1913, the number of such companies formed has been small. The new projects are usually small systems affecting the water supply of the State but little, and the communities served are unimportant villages, for all the large towns have water works plants. It is noted in Table No. 1 that 72 per cent. of the companies formed in 1913 were in operation at the close of the year, the high percentage being explained in part by the fact that many of them were operating at the time of incorporation. Another explanation of this is that the water power companies, which are included in the number incorporated, are nearly all operating, which has not been the case in previous years. This percentage is greater than for any year except 1910, even though those formed in previous years have had longer time to construct their works.

This part of the regular work of the Commission, which formerly was important, has fallen behind that of the Encroachment, Dam, and Stream Gaging divisions, whose work has grown in quantity and improved in quality. The Commission feels that its most important sphere of action is in these lines, and in water power, flood control and other economic issues involved in the conservation, utilization and regulation of the streams; while the question of water supply for municipal use, in so far as the incorporation of new companies and new supplies for old ones is concerned, might properly come under the Public Service Commission and the Department of Health, respectively. The Act of 1905 and its enforcement by the Commission has stopped the former practice of organizing water and water power companies for speculation purposes, thus realizing the original purpose of the Act.

The Incorporation of Small Plants.

In connection with applications for the incorporation of small water works systems, the question has arisen as to whether or not they are worthy of being dignified by incorporation. These companies are usually financially weak, and often cannot give the service and make the improvements expected of an incorporated company. The essentials of service are ample water of good quality, supplied under sufficient pressure throughout the populated district. The company should be strong enough to extend its lines as the town expands, increase its water supply as the demand grows, and install fire protection of adequate proportions when the community is ready to pay for it. Fire service requires good pressure, large sizes of pipe, and storage for impounding water to extinguish conflagrations. A system designed for adequate fire protection is more than ample in all these particulars for domestic service. These small companies come to the Commission with plans showing systems incapable of furnishing adequate fire protection, and if they should be permitted to be so built would require reconstruction when fire protection had to be furnished. The Commission has taken the position that these works should be so designed and built originally as to permit of fire protection at such time as it is demanded, and, for that reason, requires a certain minimum of storage, pipe line diameter and pressure, by attaching conditions to the charters when they are approved. This procedure often increases the first cost of the work and limits the net returns during the early years, but in the end it is believed to be beneficial both to the community and the water company.

Status of Companies Incorporated in 1913.

Tables Nos. 2, 3 and 4 show, respectively, the water companies incorporated in 1913; those companies in Table No. 2 which are operating, giving the sources of supply and character of works; and the consolidations effected among water supply companies during 1913. In the previous reports of the Commission water power companies have been included in this table, but in this report they are treated separately.

TABLE NO 2.

Water Companies Incorporated in 1913

Name.	Date of Incorporation.	Territory Covered by Charter.	Status.
1. Aspers Water Co.,	June 11. 1913,	Menallen Township, 1 mile radius from Aspers village, Adams Co.,	Active.
2. Bald Eagle Township Water Co.,	June 9. 1913,	Bald Eagle Township, Clinton Co.,	Active.
3. The Boiling Springs Water Co.,	March 24, 1913,	South Middleton Township, Cumberland Co.,	Active.
4. Cairnbrook Water Co..	April 25, 1913,	Shade Township, Somerset Co.,	Not in operation.
5. Castanea Water Co.,	June 9, 1913,	Castanea Township, Clinton Co.,	Active.
6. Colver Water Co.,	April 25, 1913,	Cambria Township, Cambria Co.,	Active.
7. Flemington Water Co.,	June 9, 1913,	Flemington Boro., Clinton Co.,	Active.
8. Hershey Water Co.,	May 13, 1913,	Portion of Derry Township, Dauphin Co.,	Under construction.
9. Lamar Water Supply Co.,	February 28, 1913,	Lamar Township, Clinton Co.,	Not in operation.
10. Lansdown Park Water Co.,	February 28, 1913,	Lansdown Park, South Abingdon Township, Lackawanna Co.,	Active.
11. Millersville Water Co.,	June 11, 1913,	Manor Township, Lancaster Co.,	Not in operation.
12. Northern Cambria Water Co.,	January 21, 1913,	Susquehanna Township, Barnesboro and Spangler, Cambria Co.,	Active.
13. Plainfield Water Co.,	January 2, 1913,	Plainfield Township, Northampton Co.,	Active.
14. Roseto Water Co.,	January 2, 1913,	Roseto Boro., Northampton Co.,	Active.
15. Whitaker Water Co.,	September 5, 1913,	Whitaker Boro.. Allegheny Co.,	Active.
16. Woodward Township Water Co.,	June 9, 1913.	Woodward Township, Clinton Co.,	Active.

Table No. 2 shows that 16 water companies were incorporated in 1913, all of which are for the supply of water for domestic use. Twelve of these, or 75 per cent., are engaged in serving the public, and one is under construction. Five were formed at the request of the Commission to cover boroughs and townships in the vicinity of Lock Haven, which were being supplied by two companies whose charters did not cover all the districts supplied. Of the 16 companies formed, 8 were operating previous to incorporation. One consolidation by merger was effected.

TABLE NO. 3.

Water Supply Companies Incorporated in 1913 which are in Operation.

Name.	Supplies.	Source of Supply.	System of Supply.
1. Aspers Water Co.,	Aspers Village, Adams Co.,	Springs,	Gravity.
2. Bald Eagle Township Water Co.,	Bald Eagle Township, Clinton Co.,	Tributaries of Queens Run,	Gravity.
3. The Boiling Springs Water Co.,	Boiling Springs Village, Cumberland Co.,	Well,	Pumping.
4. Castanea Water Co.,	Castanea Township, Clinton Co.,	Tributaries of Queens Run,	Gravity.
5. Colver Water Co.,	Colver Village, Clinton Co.,	Vetera Branch of N. Branch of Black Lick Creek,	Pumping.
6. **Flemington Water Co.,**	Flemington Boro., Clinton Co.,	Tributaries of Queens Run,	Gravity.
7. Lansdown Water Co.,	Lansdown Park, S. Abingdon Township, Lackawanna Co.	Drilled well,	Pumping.
8. Northern Cambria Water Co.,	Spangler and Barnesboro, Cambria Co.,	Browns Run,	Gravity.
9. Plainfield Water Co.,	Plainfield Township, Northampton Co.,	Springs,	Gravity.
10. Roseto Water Co.,	Roseto Boro., Northampton Co.,	Springs and Martins Creek,	Gravity and pumping.
11. Whitaker Water Co.,	Whitaker Boro., Allegheny Co.,	South Pittsburgh Water Co., Monongahela River,	Pumping.
12. Woodward Township Water Co.,	Woodward Township, Clinton Co.,	Tributaries of Queens Run,	Gravity.

Table No. 3 shows that of the 12 active companies 8 receive water from running streams, 2 from springs, and 2 from drilled wells; 7 operate by gravity and 4 by pumping, while 1 is operated by combined gravity and pumping. These 12 charters represent only 7 separate systems, as 5 of them operate from a single source of supply under one management, and 2 others operate from a single source.

TABLE NO. 4.

Merger of Water Companies Effected During 1913.

HOLDING COMPANY.		CONSTITUENT COMPANIES.		Date of Consolidation.
Name.	Incorporated for	Name and Date of Incorporation.	Incorporated for	
Northern Cambria Water Co.,	Susquehanna Township, Cambria Co.	Barnesboro Water Co., June 7, 1899, ...	Barnesboro, Cambria Co., ...	January 21, 1913.
		Spangler Water Co., August 19, 1892, ...	Spangler Village, Cambria Co., ...	
		Northern Cambria Water Co., October 19, 1909.	Susquehanna Township, Cambria Co.,	

Table No. 4 shows that one consolidation has taken place among the water companies during the year. The fact that, under the Act of 1909, when water companies consolidate by merger or sale of rights and franchises they lose the right of eminent domain as respects water rights, has probably done much to discourage the consolidation of existing corporations.

New Water Power Companies.

During the year 9 applications were approved for the incorporation of water power companies, which is a greater number than have been approved in any year except 1912, when 21 were formed. Of these 9 companies, 6 are classed as in operation, being a far greater proportion than in any previous year. Table No. 5 shows the water power charters granted each year since 1905, and the present status thereof. It is to be noted that the 4 companies incorporated in 1912 and the 6 in 1913, which are classed as operating, are not new plants, but represent the incorporation of small existing works, in which the procedure has been to obtain a separate charter for each township concerned in the development, constituting an effort to place existing plants in conformity with the laws controlling and affecting water power companies. No new power plant has been constructed under a water power charter for the last five years. The table further shows that 39 out of 52 water power companies, formed since May 4, 1905, have not used their charters, and most of them have therefore lapsed by non-use. Of the 13 water power companies which are operating under charters approved by the Commission, only one was entirely built subsequent to getting its charter; all of the others were either under construction or already operating when the charters were secured.

TABLE NO. 5.

Number of Water Power Companies Incorporated Each Year from May 4, 1905 to December 31, 1913.

Year.	Number incorporated.	Number in operation.	Number not operating.
1905,	2	0	2
1906,	3	2	1
1907,	2	0	2
1908,	3	1	2
1909,	8	0	8
1910,	1	0	1
1911,	3	0	3
1912,	21	4	17
1913,	9	*6	3
Total,	52	13	39

*Five of these companies have not yet legally taken over the property of the electric companies which they were formed to supersede.

Of the 9 charters granted in 1913, three were mergers of charte previously approved, but under which water power was not yet bein generated. Five cover three plants which have been operating o Conestoga Creek, Lancaster County, under electric light, heat an power charters; and one covers a plant, under construction at th time application was made, on the Schuylkill River at Phoenixvill The five charters granted for Conestoga Creek have been classe as in operation, although the property has, up to this time, nc been transferred to the new companies.

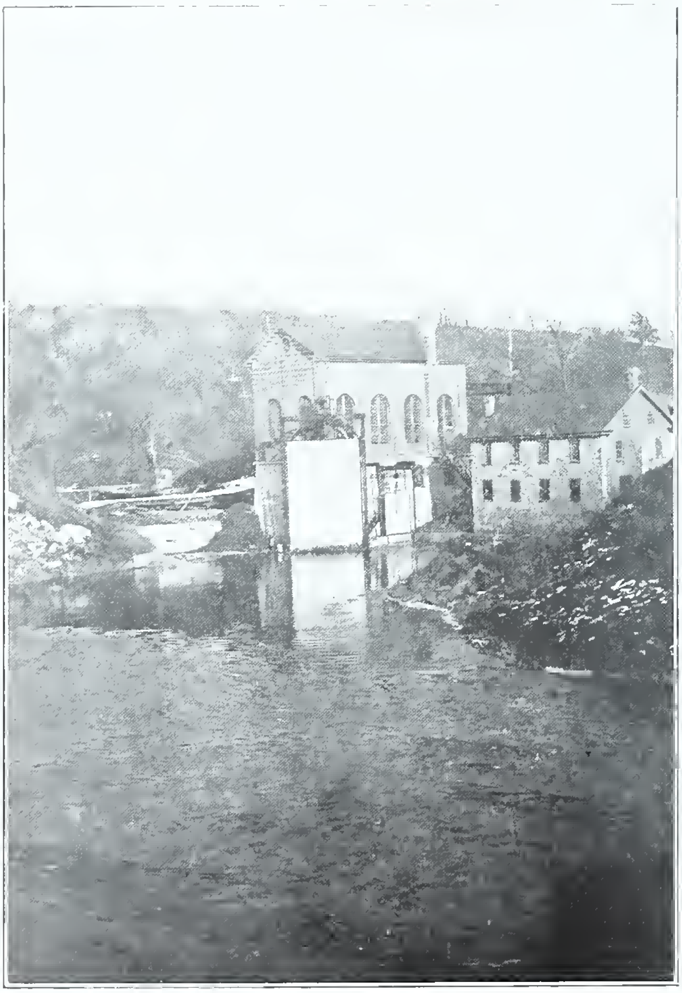
Table No. 6 shows the water power companies formed in 191 date of incorporation, district covered by charter, and present statu

TABLE NO. 6.

Water Power Companies Incorporated in 1913.

Name.	Date of Incorporation.	District Covered by Charter.	Present Status.
1. Bradford Power Co., ...	August 24, 1913,	Bradford County Merger,	Not in operation.
2. Buchanan Water & Power Co.	May 13, 1913,	Lancaster Township, Lancaster Co.	Active.
3. Central Brodhead Power Co.,	January 21, 1913,	Monroe County Merger,..	Active.
4. Hamilton Water & Power Co.	May 13, 1913,	Manor Township, Lancaster Co.	Active.
5. Lafayette Water & Power Co.	May 13, 1913,	Pequea Township, Lancaster Co.	Active.
6. Lancaster County Water & Power Co.	June 9, 1913,	Lancaster County, ...	Active.
7. Penna.-N. Y. and N. J. Power Co.	January 21, 1913,	Merger, ...	Not in operation.
8. Phoenix Water Power Co., ..	April 25, 1913,	Upper Providence Township, Montgomery Co.	Under constructi
9. Stevens Water & Power Co.,	May 13, 1913,	Conestoga Township, Lancaster Co.	Active.

Table No. 7 shows the name, district supplied with power, cap city of plant, and stream used by the water power companies, inco porated in 1913, which are in operation.



Dam and Power House, Conestoga Creek, Rock Hill Plant.

TABLE NO. 7.

Water Power Companies Incorporated in 1913 which are in Operation.

Name.	Market Supplied.	Capacity.	Stream Used.
1. Buchanan Water & Power Co.,	Lancaster city and vicinity, ...	240 H. P.	Conestoga Creek.
2. Central Brodhead Power Co.,	Stroudsburg and vicinity, ...	1,250 H. P.	Brodheads Creek.
3. Hamilton Water & Power Co.,	Lancaster city and vicinity, ...	450 H. P.	Conestoga Creek.
4. Lafayette Water & Power Co.,	Lancaster city and vicinity, ...	240 H. P.	Conestoga Creek.
5. Lancaster County Water & Power Co.	Lancaster city and vicinity, ...	1,000 H. P.	Conestoga Creek.
6. Stevens Water & Power Co.,	Lancaster city and vicinity, ...	450 H. P.	Conestoga Creek.
		3,630 H. P.	
Deduct for plants counted twice,	....	690 H. P.	
Total, ...	....	2,940 H. P.	

Table No. 8 shows the mergers of water power companies which have been approved by the Commission during 1913, none of the companies included in these consolidations having built their plants.

TABLE NO. 8.

Consolidation of Water Power Companies Effected During 1913.

Holding Company.		Constituent Companies.			
Name.	Incorporated for	Name.	Date of Incorporation.	Incorporated for	Form and Date of Consolidation.
Bradford Power Co., ...	Six townships and one borough, Bradford Co.	Asylum Water Power Co., ...	September 17, 1909,	Asylum Township, Bradford Co.	Merger. Aug. 26, 1913.
		Wysox Water Power Co., ...	September 17. 1909,	Wysox Township, Bradford Co.	
		Sheshequin Water Power Co., ...	September 17. 1909,	Sheshequin Township, Bradford Co.	
		Ulster Water Power Co., ...	September 17, 1909,	Ulster Township, Bradford Co.	
		North Towanda Water Power Co.,	September 17, 1909,	North Towanda Township, Bradford Co.	
		Borough Water Power Co., ...	September 17. 1909,	Towauda Borough, Bradford Co.	
		Towanda Water Power Co., ...	September 17, 1909,	Towanda Township, Bradford Co.	
Central Brodheads Power Co.	Stroud and Smithfield Townships, Stroudsburg and East Stroudsburg Boroughs, Mouroe Co.	Central Brodheads Power Co., ...	April 29, 1912, ...	Stroud Township, Monroe Co.	Merger. Jan. 21, 1913
		Lower Brodheads Power Co., ...	April 29, 1912, ...	Smithfield Township, Monroe Co.	
		Middle Brodheads Power Co., ...	April 29, 1912, ...	Stroudsburg Borough, Monroe Co.	
		Upper Brodheads Power Co., ...	April 29, 1912.	East Stroudsburg Borough, Monroe Co.	
Penna.-N. Y. & N. J. Power Co.	General Charter, ...	Wallenpaupack Power Co., ...	June 27, 1911, ...	Palmyra Township, Pike Co.	Merger, Jan. 21, 1913
		Paupack Power Co., ...	October 4, 1910, ...	General Charter.	

Dam and Power House, Conestoga Creek, Wabank Plant.

Dam and Power House Brodheads Creek.

The Water Power Situation in Pennsylvania.

The statistics are exceedingly illuminating of the present status of water power in Pennsylvania. In the 1912 report the Commission called attention to the activity in this State in the promotion of water power developments on a large scale, but the figures for 1913 indicate that practically no advantage has been taken of the rights that have been granted. There are several explanations of this condition, the most important of which is probably the lack of the necessary definite legislation to permit of putting through the large operations. Notwithstanding the occupation of many of its river valleys by railroads and communities, Pennsylvania offers a number of apparently excellent sites for the development of water power on a large scale, and for smaller powers on the secondary tributaries. Advances in prime movers actuated by steam, gas or oil permit the development of power with small fuel consumption, and the high speed at which these prime movers operate enables the use of direct connected generators, so that the installation cost of the equipment is small and its operating cost closely competes with hydro-electric power. Where stream regulation is practicable, and the average discharge can be maintained throughout the year, hydro-electric machinery can obtain a fair utilization of the possible water power. In the absence of storage to maintain this regulation, complementary plants, operating by water and by fuel, make water power available which otherwise would not be remunerative. Generally, hydro-electric installations must be designed to compete with the modern, high speed plants utilizing fuel, which can be located in the midst of a section to which electricity can be distributed, whereas hydro-electric plants must develop power where it is available and transmit it for distribution.

The Commission took the position, during the first six months of the year that, pending the passage of legislation affecting water power companies, no new developments should be authorized. After the Legislature enacted the Water Inventory law, the Commission was convinced that its previous position should be maintained until the applications could be studied in connection with an inventory of the developed and undeveloped water powers of the State.

CHAPTER III.

DAMS AND ENCROACHMENTS.

Introduction.

Under the provisions of the Act of May 28, 1907, the Water Supply Commission of Pennsylvania exercised limited jurisdiction over the construction of encroachments in or along public or navigable rivers or streams which had been declared public highways. This act did not, however, include all streams in the Commonwealth, nor provide a penalty for failure to comply with its provisions. On September 30, 1911, the failure of a concrete dam on Freeman's Run, at Austin, resulted in a loss of 77 lives and great property damage. Freeman's Run had been declared a public highway from its mouth in Sinnemahoning Creek to the north line of the farm of E. O. Austin, which is in the Borough of Austin, so that the dam was approximately a mile beyond the point to which the jurisdiction of the Commission extended. The Commission had no knowledge of its construction, nor of the condition of the structure subsequent thereto, and it was not until its failure that attention was drawn to it. The failure proved the necessity for State control and supervision of the design and construction of all dams, so that the public might be protected against similar disasters. The Governor went to Austin shortly after the failure, and that he realized the importance of State supervision and control over dams hereafter built, and also of determining the condition of existing dams so that they might be strengthened and made safe, where necessary, is indicated in his message to the Legislature of 1913, in which he said:

"On September 30, 1911, at Austin, Potter County, a masonry dam collapsed, resulting in the destruction of the town and the loss of 77 lives. A similar catastrophe occurred at Johnstown in the year 1889. Remedial legislation to prevent the recurrence of such tragedies should be enacted.

"Immediately upon the Austin dam failure, I instructed the State Water Supply Commission to institute an examination of all existing dams of importance in Pennsylvania. This Commission has declined, with my approval, to sanction the issuance of a charter to any water power company, until the Legislature shall have had an opportunity to consider granting authority to aid the Commission to effectively control dams in all essential matters pertaining to their design, construction, and operation.

"I recommend that the State Water Supply Commission be given authority, at its discretion, or on petition or complaint of citizens, to pass upon the design and construction, and to control the operation of any dam, wall, wing-wall, wharf, pier, embankment, abutment, projection, or other obstruction to be built in or along any river or stream, and that the Commission be empowered to examine all existing dams and structures, with power to require repairs to insecure structures, or to direct their removal."

Shortly after the Austin dam failure, the Governor instructed the Water Supply Commission to examine all important dams in the Commonwealth, to pass upon the plans for new dams, and to take necessary steps to safeguard life and property from similar calamities. This the Commission did to the best of its ability, with the limited force and appropriation at its command, until on June 25, 1913, a law was enacted which gave the Commission complete jurisdiction over proposed dams and other water obstructions, and authorized it, upon complaint, or upon its own initiative, to cause an examination to be made of any existing dam or other water obstruction, on any stream within or forming a part of the boundary of the Commonwealth, whose drainage area is greater than one-half square mile, except the tidal waters of the Delaware River and of its navigable tributaries, and providing penalties for the violation of the provisions thereof. This act follows:

DAM AND ENCROACHMENT ACT

An act providing for the regulation of dams, or other structures or obstructions, as defined herein, in, along, across, or projecting into all streams and bodies of water wholly or partly within, or forming part of the boundary of, this Commonwealth; vesting certain powers and duties in the Water Supply Commission of Pennsylvania, for this purpose; and providing penalties for the violation of the provisions hereof.

Section 1. Be it enacted &c., That the term "water obstruction," as used in this act, includes any dam, wall, wing-wall, wharf, embankment, abutment, projection, or similar or analogous structure, or any other obstruction whatsoever, in, along, across, or projecting into any stream or body of water wholly or partly within, or forming part of the boundary of, this Commonwealth, except the tidal waters of the Delaware River and of its navigable tributaries.

The word "construct" shall be taken to mean construct, erect, build, place, or deposit..

Section 2. From and after the passage of this act, it shall be unlawful for any person or persons, partnership, association, corporation, county, city, borough, town, or township to construct any dam or other water obstruction; or to make or construct, or permit to be made or constructed, any change therein or addition thereto; or to make, or permit to be made, any change in or addition to any existing water obstruction; or in any manner to change or diminish the course, current, or cross section of any stream or body of water, wholly or partly within, or forming a part of the boundary of, this Commonwealth, except the tidal waters of the Delaware River and its navigable tributaries, without the consent or permit of the Water Supply Commission of Pennsylvania, in writing, previously obtained, upon written application to said commission therefor.

Section 3. Each application for the consent or permit required by the second section of this act shall be accompanied by complete maps, plans, profiles, and specifications of such water obstruction, or of the said changes or additions proposed to be made, and such other data and information as the commission may require.

Section 4. The commission shall have power to grant or withhold such consent or permit, or may incorporate in and make a part of said consent or permit such conditions, regulations, and restrictions as may be deemed by it advisable. It shall be unlawful to construct or begin the construction of any such water obstruction, or to make or begin any change or addition aforesaid, except in accordance with the terms, conditions, regulations, and restrictions of such consent or permit, and such rules and regulations, with regard to said constructions, changes, or additions, as may be prescribed by the commission.

Section 5. Upon complaint, or upon its own initiative, the commission shall have power to cause an investigation or examination to be made of any dam, or other water obstruction now existing or hereafter constructed. If the Commission shall determine that such dam or water obstruction is unsafe or needs repair, or should be removed as being unsafe and not susceptible of repair, the commission shall, in writing, notify the owner or owners thereof to repair or remove the same, as the exigencies of the case may require; such work to be commenced and proceeded with to completion within such reasonable time as may be prescribed in such notice by the commission. And it shall thereupon be and become the duty of such owner or owners to comply with the provisions of such notice.

If said owner or owners, notified as aforesaid, shall neglect or refuse to make such repairs or to cause such removal, or if said owner or owners cannot be found or determined, then it shall be and become the duty of the commission to make such repairs or cause such removal: and the commission may thereafter recover, in the name of the Commonwealth, from the owner or owners, the said cost or expense, in the same manner as debts are now by law recoverable.

Section 6. If the condition of any dam or other water obstruction be so dangerous to the public safety as not to permit of the giving of the notice, hereinabove provided, to the owner or owners of such obstruction, to remove such dangerous condition, the commission shall have power to remedy such condition by repair, removal, or otherwise, and may recover the cost and expense thereof from the owner or owners as debts are now by law recoverable.

Section 7. Any person or persons, partnership, association or corporation, county, city, borough, town or township, that shall do or cause to be done; or that shall fail, neglect or refuse to do, or cause to be done, any act or thing contrary to the provisions of this act; or that shall violate, or fail to comply with, any order of the commission, of which due notice shall be given; or that shall violate any of the provisions of this act, shall be guilty of a misdemeanor; and, upon conviction thereof, shall be sentenced to pay a fine of not more than one thousand dollars, or, in the discretion of the court, such person or persons, or the members of such partnership or association, or the officers and directors of such corporation, or the officers of such county, city, borough, town, or township, as the case may be, sentenced to undergo an imprisonment in the county jail for a period not exceeding one year, either or both, in the discretion of the court.

Section 8. Upon application of the commission, verified by oath or affirmation, the court of common pleas of any county, sitting in equity, may, by injunction, enforce the compliance with, or restrain the violation of, any order or notice of the commission made pursuant to the provisions of this act, or restrain the violation or attempted violation of any of the provisions of this act.

Section 9. The provisions of this act shall not prohibit the placing in any purely private stream, having a drainage area of less than one-half square mile, of any dam or obstruction that cannot in any way imperil life or property located below or above such dam or obstruction; nor shall the provisions of this act prohibit the making of necessary temporary repairs to any water obstruction.

Section 10. All acts and parts of acts inconsistent herewith are hereby repealed; but nothing in this act contained shall be construed to repeal in any way, or in any way alter or abridge, the provisions of the act approved the twenty-second day of April, one thousand nine hundred and five, entitled "An act to preserve the purity of the waters of the State, for the protection of the public health," or of an act approved the twenty-seventh day of April, one thousand nine hundred and five, entitled "An act creating a Department of Health, and defining its powers and duties;" or of an act approved the thirteenth day of April, one thousand nine hundred and five, entitled "An act providing that the right of eminent domain, as respects the appropriation of streams, rivers or waters, or the land covered thereby, shall not be exercised by water companies incorporated by law;" and nothing in this act contained shall confer upon any municipality, township, or corporation whatsoever, the power to take or use by eminent domain any of the water resources of the Commonwealth, or any of the land covered thereby. And nothing in this act contained shall be construed to vest in the said Water Supply Commission any powers or authority heretofore vested by law in the directors of the Department of Wharves, Docks, and Ferries, of cities of the first class, or in the Board of Commissioners of Navigation for the River Delaware and its Navigable Tributaries; but the said directors and the said board shall have the power and authority over the river Delaware and its navigable tributaries heretofore conferred; and nothing in this act contained shall be construed to repeal in any way, or in any way alter or abridge, the provisions of the act approved the eighth day of June, one thousand nine hundred and seven, entitled "A supplement to an act, entitled 'An act to provide for the better government of cities of the first class in this Commonwealth,' approved the first day of June, one thousand eight hundred and eighty-five; creating the Department of Wharves, Docks, and Ferries, for the improvement, regulation, and supervision of the construction, extension, alteration, maintenance, and use of wharves, piers, bulkheads, docks, slips, basins, ferries, harbors, and harbor structures, in cities of the first class; and providing for the making and enforcement of rules and regulations, and fixing certain penalties for violation thereof; and providing for the acquisition of property by said cities by purchase and by condemnation, for certain purposes;" or of an act approved the eighth day of June, one thousand nine hundred and seven, entitled "An act to establish a Board of Commissioners of Navigation for the river Delaware and its navigable tributaries; regulating their jurisdiction over ships, vessels, and boats, and wharves, piers, bulkheads, slips, and basins; and exempting cities of the first class from certain of its provisions; and making an appropriation therefor."

Approved—The 25th day of June, A. D. 1913.

JOHN K. TENER.

In order to expedite the work under the act, separate divisions were created in the Engineering Department, to be called the Dam and the Encroachment divisions.

The work of the Dam Division is confined exclusively to the consideration of dams, proposed, in process of construction, or previously built. The sites of proposed dams are visited and the plans and specifications analyzed and passed upon. If a permit is issued, periodic examinations are made during construction, especially at critical stages of the work, to see that the plans and specifications are followed and to assure faithful and intelligent performance of the work. This division also makes examinations of existing dams, secures plans, specifications and information regarding methods employed and materials used, and reports to the Commission on their condition and stability. If repairs or strengthening is ordered, the plans and specifications are passed upon, and examinations are made during the progress of the work, as in the case of new dams.

The Encroachment Division handles all of the work required under this act, exclusive of dams. The sites of proposed piers, abutments, approach fills for bridges, retaining walls, fills, and other water obstructions are examined, and reports are submitted to the Commission based upon said examinations, containing recommendations with regard to approval or disapproval of the application and conditions to be made part of the permit. Where permits are issued examinations are made during construction, for the purpose of seeing that the work is done in accordance with the approved plans and requirements of the Commission.

DAM DIVISION.

Since the passage of the Dam and Encroachment Act, there have been no dams of magnitude begun or built in Pennsylvania without the approval of the Water Supply Commission. Thirty-three existing dams have been examined to determine their strength and condition, of which 18 have been ordered repaired. This legislation gives the Commission comprehensive jurisdiction and ample powers, and the enforcement of its provisions is receiving the support of the owners of dams and the appreciation of the public.

Section 2 of this act provides that it is unlawful to construct a dam, or to make, or permit to be made, any change in or addition to an existing dam, without applying to and receiving the consent or permit of the Water Supply Commission. Section 5 provides for the examination of existing dams, either upon complaint or upon the initiative of the Commission. The work of the Dam Division is divided into two classes, under sections 2 and 5, as outlined above, and is thus classified in the following discussion:

New Work—Methods Employed.

New work, as considered by the Commission, comprises the building of proposed dams, and the reconstruction or alteration, repair or strengthening, of those already built. The owners or builders of such work must file an application setting forth the name of the person or persons, partnership, association, corporation, county, city, borough, town, or township making the application; whether the application is for the construction of a proposed dam or for a change in or addition to an existing dam; the name of the stream on which the dam is to be built; the exact location of the structure;

and the purpose, necessity for, and a description of the proposed work. The act provides that the application be accompanied by complete maps, plans, profiles and specifications of the proposed dam, or of any changes in or additions to an existing dam, and such other data and information as the Commission may desire. In the case of large structures the Commission requires that explorations be made by means of test pits or core drillings, to determine the nature of the foundation and its suitability for the purpose intended. The plans, specifications and data submitted must be in sufficient detail to permit of clear anaylsis and intelligent consideration of the application.

When the application has been submitted, and the plans, specifications and other necessary data are complete, an inspection of the site is made by a representative of the Commission, and a careful examination is made to determine its suitability for such a structure, especially with regard to the foundation as indicated by the test pits or core drillings, and the adaptibility of the available materials for use in construction. Following this examination a careful study is made of the plans and specifications, and a report is prepared for submission to the Commission, containing the recommendations of the engineer with regard to the approval or disapproval of the application, and, where approval is recommended, certain conditions are suggested to be attached to the permit. Such conditions may provide for changes in the plans and specifications to meet the requirements of the Commission, and may demand the employment of a competent engineer to be on the ground during construction, to interpret the plans and specifications, to require faithful performance of the work, and to pass upon the character and placing of materials. When the application is approved and construction is begun, examinations are made from time to time by representatives of the Commission and the work followed carefully from commencement to completion.

During the year there were received 21 applications for permission to construct dams, 5 for the approval of dams recently completed, and 9 for permission to make changes in or alterations to existing dams. Of these 35 applications, 23 were approved, and including one filed in 1912 a total of 24 applications received favorable action, five of which were for dams already constructed and 19 for new dams, or changes or alterations to existing structures, leaving 12 applications before the Commission on January 1st, 1914; of these latter 4 had been reported upon and held under advisement, 3 held pending the submission of revised plans, and the remaining 5 had been recently received. Of the 19 new dams approved, construction was commenced on 14, 2 were abandoned, and it was the evident intention to start work of the other 3 early in 1914. Of the 14 upon which work was started, 3 have been completed and 6 nearly so, leaving but 5 upon which there is any considerable amount of work remaining to be done.

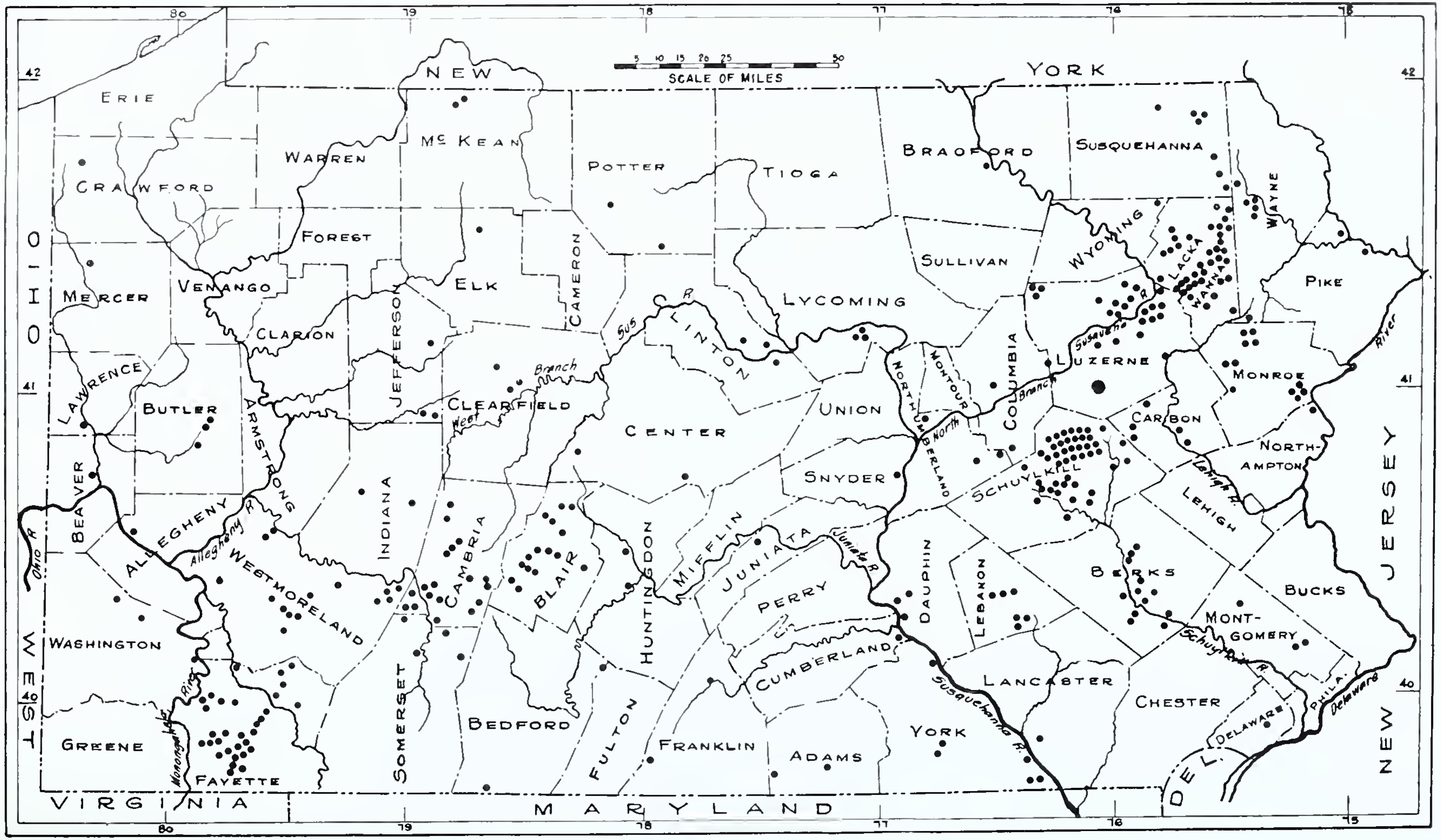
Table No. 9 shows the applications which have been received for approval of the construction of new dams or for changes in or additions to existing dams, the location of said structures, the date upon which the application was received and of the examination by a representative of the Commission, and the action taken by the Commission upon said applications.

TABLE NO. 9.

Applications for Dams Received and Approved During 1913.

Owner.	Location.	Date Received.	Date Examined.	Action of Commission.
1. Elmer Albert,	Near Stroudsburg, Monroe Co.,	Nov. 5th,	Nov. 22d,	Held under advisement.
2. Apollo Water Works Co.,	Tributary of Beaver Run, Westmoreland Co.,	April 10th,	April 28th,	Approved, May 6th, 1913.
3. Bear Gap Water Co.,	Roaring Creek, near Shamokin, Columbia Co.,	June 9th,	July 11th, Nov. 25th.	Plans modified.
4. Beaver Creek Fish and Game Association,	Bieber Run, Berks Co.,	June 27th,	July 1st,	Approved, Sept. 9th, 1913.
5. T. D. Boal.	Boalsburg, Centre Co.,	Oct. 30th,	Nov. 1st,	Approved, Dec. 4th, 1913.
6. C. G. Cherry,	Conneaut Creek, near Cherry Hill, Erie Co.,	Sept. 5th,	Sept. 22d,	Held under advisement.
7. Citizens Water Co.,	Cold Stream, near Philipsburg, Centre Co.,	Sept. 12th,	Sept. 26th,	Approved. Sept. 30th, 1913.
8. Coatesville Borough,	Rock Run, Chester Co.,	Dec. 27th,		
9. Columbia and Montour Electric Co.,	Fishing Creek, near Bloomsburg, Columbia Co.,	July 5th,	July 10th,	Approved, July 15th, 1913.
10. Colver Water Co.,	Vetera Branch of Black Lick Creek, Cambria Co.,	June 6th,	July 17th,	Approved. Oct. 20th, 1913.
11. Cummings Water Co.,	Getty Run, Indiana Co.,	March 8th,	June 5th,	Approved, July 15th, 1913.
12. Forged Steel Wheel Co.,	Connoquenessing Creek, near Butler, Butler Co.,	Dec. 18th, 1912,	Nov., 1912,	Approved, June 6th, 1913.
13. Girard Water Co.,	Dresher's Run, Schuylkill Co.,	April 14th,	March 20th,	Approved, April 22d, 1913.
14. E. A. Graves,	Conneaut Creek, Springboro, Crawford Co.,	July 31st,	Aug. 2d,	Approved, August 26th, 1913.
15. Greenville Water Co.,	Tributary of Little Shenango River, Mercer Co.,	May 17th,	May 23d,	Approved, June 6th, 1913.
16. Ketner Water Co.,	Johnson Run, Elk Co.,	March 8th,	June 5th,	Approved, July 15.
17. Jacob B. Kunkel & Son,	Conewago Creek. York Co.,	Sept. 6th.	Oct. 27th,	Held under advisement.
18. Kyle Water Co.,	Kyle Run, Jefferson Co.,	March 8th,	June 5th,	Approved, July 15.
19. Larry's Creek Fish and Game Association,	Larry's Creek, Lycoming Co.,	Sept. 15th,		Approved, Sept. 30th.
20. Lehigh Valley R. R.,	Beaver Run, near Lehighton, Carbon Co.,	Dec. 17th,		
21. Lehigh Valley R. R.,	Mahoning Creek, near Lehighton, Carbon Co.,	Dec. 17th,		
22. Mahanoy City Water Co.,	Messers Run, Schuylkill Co.,	Sept. 5th,	Sept. 11th,	Approved, Oct. 20th.
23. Manufacturers Water Co.,	Quemahoning Creek, Somerset Co.,	March 1st,	May 2, 1912,	Approved, April 22d.
24. Mercersburg Water Co.,	Buck Run, Franklin Co.,	March 3d,	March 6th,	Approved, April 22d.
25. F. N. Moore,	Lake Meadows, Bradford Co.,	Aug. 15th,	Aug. 5th,	Approved, Aug. 26th.
26. Mt. Penn Suburban Water Co.,	Tributary of Antietam Creek, Berks Co.,	Sept. 11th,	July 8th,	Approved, Sept. 30th.
27. E. G. Obert and A. F. Greenawalt,	Big Creek, Strohls Grove, Carbon Co.,	July 28th,	Aug. 9th,	Approved, Aug. 26th.
28. Penn Central Power and Transmission Co.	Frankstown Br. of Juniata River, Blair Co.,	Dec. 12th,	Nov. 13th,	Approved, Dec. 18th.
29. Penna. Training School,	Morganza Run, Washington Co.,	June 21st,	July 15th,	Approved. July 31st.
30. Pittsburgh, Harmony, Butler and New Castle Railway Co.	Connoquenessing Creek, Harmony Jct., Butler Co.,	Aug. 25th,	Sept. 3d,	Approved, Sept. 9th.
31. Raystown Water Power Co.,	Raystown Branch, Juniata River, Huntingdon Co.,	May 22d,	Aug. 8th.	Flashboards. Plans revised.
32. Shohola Falls Hydro-Electric Company,	Shohola Creek and Pond Creek, Pike Co.,	Dec. 12th,		
33. Shippensburg Gas and Electric Co.,	Connodoguinet Creek, Franklin Co.,	Sept. 9th,	Sept. 1st,	Plans incomplete.
34. Susquehanna County Electric Co.,	Pages Pond, Susquehanna Co.,	Dec. 17th,		
35. Troy Borough Water Works,	West Branch, Sugar Run, Bradford Co.,	April 12th,	May 8th,	Approved, May 15th, 1913.
36. York Haven Water and Power Co.,	Susquehanna River, Dauphin Co.,	Dec. 4th,	Dec. 8th,	Held under advisement.

WATER SUPPLY COMMISSION OF PENNSYLVANIA



MAP SHOWING LOCATION OF IMPORTANT DAMS

Table No. 10 shows the examinations which have been made by representatives of the Commission of dams under construction, for which permits had previously been obtained.

TABLE NO 10.

Examinations of Dams Made During Construction in 1913.

Owner.	Location.	Date of Examination.
1. Apollo Water Works Co.,	Tributary of Beaver Run, Westmoreland Co.	July 18. Sept. 5. Oct. 16. Nov. 26.
2. Citizens Water Co.,	Cold Stream, near Philipsburg, Centre Co.,	Oct. 31. Nov. 14.
3. Columbia and Montour Electric Co.	Fishing Creek, near Bloomsburg, Columbia Co.	Nov. 8.
4. Colver Water Company,	Vetera Branch of Black Lick Creek, Cambria Co.	Oct. 17. Oct. 30. Nov. 12. Dec. 12.
5. Evitts Creek Water Company,	Evitts Creek, Bedford, Co.,	Sept. 2.
6. Forged Steel Wheel Company,	Connoquenessing Creek, near Butler, Butler Co.	Nov. 25. Dec. 23.
7. Girard Water Company,	Dreshers Run, Schuylkill Co.,	Aug. 13. Oct. 17. Dec. 10.
8. E. A. Graves,	Conneaut Creek, Springboro, Crawford Co.,	Sept. 22. Oct. 27. Nov. 21.
9. Greenville Water Company,	Tributary of Little Shenango River, Mercer Co.	Aug. 4. Sept. 20.
10. City of Harrisburg,	Susquehanna River, Dauphin Co.,	July 29.
11. City of Lock Haven,	McElhattan Dam, Clinton Co.,	June 12. July 20. Oct. 9.
12. Mahanoy City Water Company,	Messers Run, Schuylkill Co.,	Dec. 10.
13. Mercersburg Water Company,	Buck Run, Franklin Co.,	July 25. Aug. 6. Aug. 27. Sept. 16. Oct. 24. Nov. 20. Dec. 15.
14. Mt. Penn Suburban Water Co.,	Tributary of Antietam Creek, Berks Co.,	Jan. 2. July 1. July 8. Oct. 14. Oct. 29. Nov. 17. Dec. 16.
15. North Strabane Water Co.,	Speers Run, Washington Co.,	Sept. 4. Oct. 18.
16. Panther Valley Water Co.,	Nesquehoning Creek, Carbon Co.,	Jan. 3. July 2. Oct. 16.
17. Penna. Training School,	Morganza Run, Washington Co.,	Aug. 19. Sept. 4. Oct. 18. Nov. 26.
18. Roaring Creek Water Co.,	South Branch of Roaring Creek, Columbia Co.	June 11.
19. York Water Co.,	Codorus Creek, York Co.,	Jan. 17. Feb. 7. Oct. 13.

Tables Nos. 9 and 10 indicate that 31 examinations were made by representatives of the Commission in connection with applications for new dams, or for changes in or additions to existing dams, and that 54 examinations were made of 19 dams which were under construction in 1913 with the approval of the Commission.

Following is a brief description of the dams under construction in 1913:

Apollo Water Works Co.

The Apollo Water Works Dam (Table No. 9, No. 2), on a tributary of Beaver Run, Westmoreland County, completed in November, is an earth dam with concrete core wall, forming a storage reservoir with a capacity of 10 million gallons. The dam is 300 feet long on the crest, 19 feet in maximum height, 10 feet wide on top, with 1 on 2 slopes, protected on the up-stream side with loose stone and on the down-stream side with grass. The spillway, 20 feet long and 4 feet deep, is at one end of the dam, and has a capacity for flood discharge at the rate of 1,000 second-feet per square mile from the tributary drainage area of 0.5 square mile.

Columbia & Montour Electric Co.

The Columbia & Montour Company Dam (Table No. 9, No. 9), on Fishing Creek, Columbia County, is a composite earth and timber crib structure, rebuilt for the purpose of diverting the water of Fishing Creek into a canal for power purposes. Construction work was completed in December; the earth or old section is 575 feet long, and the new timber crib or spillway section is 760 feet long. The average height is 11 feet, and the maximum height 15 feet.

Citizens Water Co.

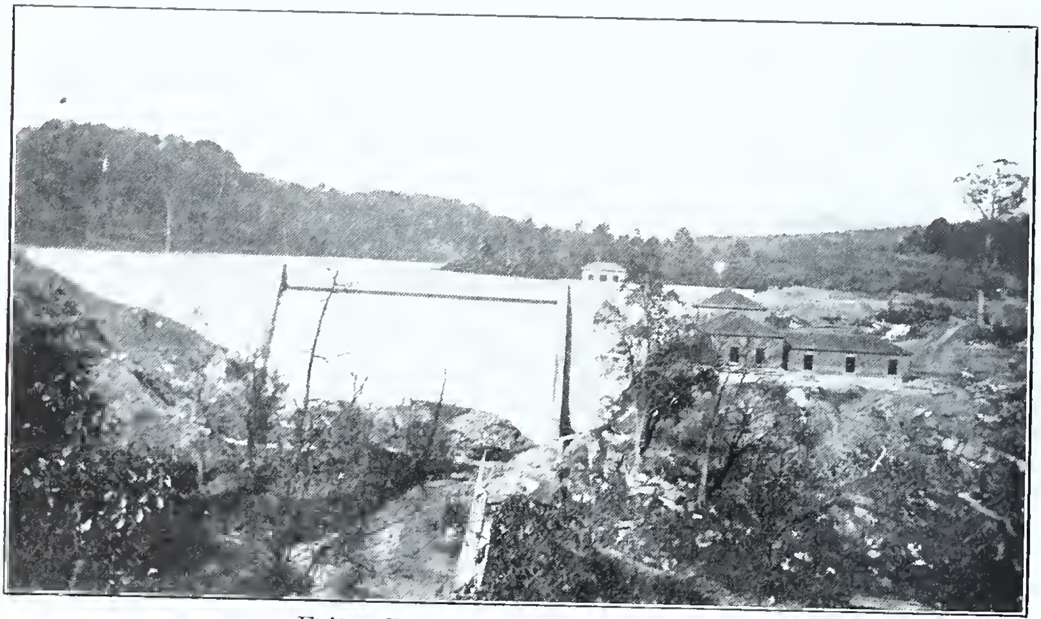
The Citizens Water Company Dam (Table No. 9, No. 7), on Cold Stream, near Philipsburg, Centre Co., now under construction, will be an earth dam, forming a storage reservoir with a capacity of about 750,000 gallons. The dam will be 210 feet long, 13 feet high, and 10 feet wide on top; the up-stream slope will be 1 on 3 and paved with stone; the down-stream slope 1 on 2 and sown with grass. It will have a concrete core-wall, and a concrete spillway section near the middle of the dam, 40 feet long and 4 feet deep, which will provide for a discharge at the rate of 280 second-feet per square mile from the 4 square miles of tributary drainage area.

Colver Water Co.

The Colver Water Company Dam (Table No. 9, No. 10), on the Vetera Branch of Black Lick Creek, in Cambria County, now under construction, will form a storage reservoir with a capacity of 20 million gallons. The work consists of reconstructing an old mill-dam, 535 feet long and 13 feet high, by building a cut-off wall and new embankment having a slope of 1 on 2½, paved with hand-laid

Apollo Water Works Company Dam.

Columbia and Montour Electric Company Dam, on Fishing Creek.



Evitts Creek Water Company Dam.

stone. The spillway at one end will be 100 feet long and 3 feet deep, and will provide for a discharge at the rate of 300 second-feet per square mile for the tributary drainage area of 5.3 square miles.

Evitts Creek Water Co.

The Evitts Water Company Dam (Table No. 10, No. 5), across Evitts Creek, Bedford County, is a masonry structure built for the purpose of forming a storage reservoir for supplying water to the city of Cumberland, Md. The dam, built of cyclopean concrete, is 235 feet long on top and 85 feet high above the bed of the creek. The capacity of this reservoir is 1,400,000,000 gallons. The spillway is 150 feet long and 9.1 feet deep, providing for a discharge at the rate of 230 second-feet per square mile from the 66 square miles above it.

Forged Steel Wheel Co.

The Forged Steel Wheel Company Dam (Table No. 9, No. 12), will be a concrete dam of ogee type. Its total length is 155 feet, 135 feet of which will be an over-fall section between abutments, 10 feet high. The crest is 19.5 feet above the foundation and 10 feet above the bed of the stream.

Girard Water Co.

The Girard Water Company Dam (Table No. 9, No. 13), on Dresher's Run, Schuylkill County, now being built, will be an earthen structure impounding 264 million gallons. It will be about 700 feet long on top and 63 feet high. The crest will be 20 feet wide and the slopes 1 on 2. A concrete and puddle cut-off, 6 feet thick, will be built at the toe of the up-stream slope, and the face paved with 12 inches of concrete, except the upper 17 feet, which will be covered with 18 inches of masonry. The spillway at one end of the dam will be 15 feet long and 5 feet deep; its capacity being 550 cubic feet per second and the tributary drainage area 1 square mile.

E. A. Graves.

E. A. Graves Dam (Table No. 9, No. 14), across Conneaut Creek, Crawford County, recently completed, is of earth and concrete, forming a pond for power and pleasure. It has a spillway section 130 feet long, 8 feet above the bed of the creek, beyond which a concrete gravity section, 6 feet higher, extends 50 feet to the hillside. Extending from the opposite end of the spillway is an earth dike, 615 feet long, 10 feet wide on top, with 1 on 2 slopes.

Greenville Water Co.

The Greenville Water Company Dam (Table No. 9, No. 15), on a tributary of the Little Shenango River, Mercer County, recently completed, is a rebuilt earth structure, forming a reservoir with a capacity of about 13 million gallons. The dam is 130 feet long on top, 16.5 feet high, has a top width of 12 feet, and slopes of 1 on 2. The upper 6 feet of the up-stream slope will be paved and the downstream slope seeded. The spillway is in rock excavation at the west end and is 35 feet long and 5.5 feet deep. The drainage area above the dam is 2.2 square miles, and the spillway capacity 1,580 cubic feet per second per square mile.

Harrisburg City.

The City of Harrisburg Dam (Table No. 9, No. 10), across the Susquehanna River at Dock street, Harrisburg, will be a reinforced concrete dam, 3,240 feet long, which will raise the low water in the river approximately 4 feet at Dock street, for the purpose of creating slack water along the river front of the city, submerging flats, and otherwise improving sanitary conditions along the water front during low stages of the river. Work on this dam can be carried on only during low stages of the river, and it is probable that it will be completed during 1914. It will consist of a series of concrete posts, tied into the rocky river bed, and on them reinforced concrete deck slabs will rest on a slope of one on two.

Lock Haven Water Works.

The City of Lock Haven Dam (Table No. 10, No. 11), on McElhattan Run, Clinton County, will be an earth structure with a concrete core-wall, forming a storage reservoir with a capacity of about 35 million gallons. The dam will be 400 feet long on top, and 28 feet high, with a top width of 20 feet. The upstream slope will be 1 on 2 and riprapped; the downstream slope 1 on 3, or flatter. A concrete spillway will be built near one end, 91 feet long and 10 feet deep, which will have a capacity for flood discharge at the rate of 630 second-feet per square mile from the tributary drainage area of 15 square miles.

Mahanoy City Water Co.

The Mahanoy City Water Company Dam, known as the Lofty Dam (Table No. 10, No. 12), on Messers Run, Schuylkill County, which is being raised, is an earth dam, with a clay puddle cut-off, and will be 1,100 feet long on top and 28 feet high. It will have a top width of 14 feet and a slope of 1 on 2 on each side. The spillway, built in excavation at one end, will be 30 feet long and 5 feet deep, and will provide for a discharge at the rate of 600 second feet per square mile from the tributary drainage area of 1.7 square miles.

Mercersburg Water Co.

The Mercersburg Water Company Dam (Table No. 10, No. 13), on Buck Run, Franklin County, completed in December, is an earthen structure with a concrete core-wall. It is 212 feet long and 24 feet

Mercersburg Water Company Dam.

Pennsylvania Training School.

The Pennsylvania Training School Dam (Table No. 10, No. 17), across Morganza Run, Washington County, is an earthen structure with a concrete core-wall, the reservoir having a capacity of 30,000,000 gallons. This dam is practically completed and is 305 feet long on top and 24 feet in maximum height. The crest is 12 feet wide and the slopes are 1 on 2; the upstream slope paved with brick and the downstream slope seeded. It has a semicircular spillway of 11.5 feet radius, discharging into a waste channel excavated in the rock at one end. The capacity of this spillway is 950 cubic feet per second per square mile, and the drainage area of the stream above the dam is 2.2 square miles.

Roaring Creek Water Co.

The Roaring Creek Water Company Dam (Table No. 10, No. 18), across the South Branch of Roaring Creek, Columbia County, was raised 8 feet, the capacity of the enlarged reservoir being 600 million gallons. This structure is an earthen embankment with a concrete core-wall, and a clay puddle wall midway between the core-wall and the upstream toe. It is 750 feet long and has a maximum height of 35 feet. The width of the crest is 20 feet, the upstream slope is 1 on 1 for the raised portion, below which it is 1 on 3. The downstream slope is 1 on 3 for the raised portion, below which it is 1 on 5. The spillway, at one end, is 60 feet long and 9 feet deep, beyond which is an emergency spillway 80 feet long and 8 feet deep. The combined capacity of the two spillways is 4,460 cubic feet per second, and they provide for a discharge at the rate of 510 second-feet per square mile from the tributary drainage area of 8.75 square miles.

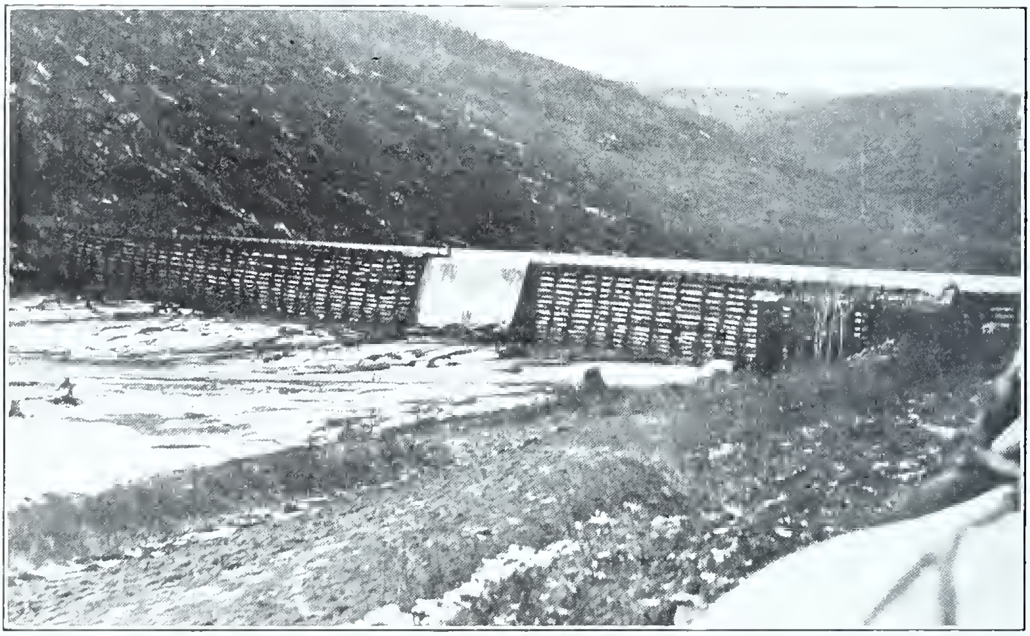
York Water Co.

The York Water Company Dam (Table No. 10, No. 19), on Dunkard Branch of Codorus Creek, York County, is an earthern structure with a concrete core-wall, which impounds 900 million gallons. It is 660 feet long, 44 feet in maximum height, and has a top width of 24 feet, upon which is an 18 foot roadway. The upstream slope is 1 on 2½ and paved with concrete; the downstream slope is 1 on 2 and seeded. The spillway, at one end, is 190 feet long and 7 feet deep, and is spanned by a concrete bridge carrying a public highway. The spillway has a capacity of 8,670 cubic feet per second, and as the tributary drainage area is 45 square miles it will carry a flood flow at the rate of 193 second-feet per square mile.

Examination of Existing Dams.

Prior to the passage of the Act of June 25, 1913, and subsequent to the failure of the Austin Dam, 12 examinations of existing dams were made by order of the Governor, 7 of these were due to complaints

York Water Company Dam.



Bayless Manufacturing Corporation—Timber Crib Dam. Upstream View Before Reinforcement.

from residents, living below the dams, who were doubtful as to their condition and fearful that they might fail and cause loss of life and destruction of property. One examination was made in response to a request from the owners of a dam, and four upon the initiative of the Commission.

The Act of June 25, 1913, gave the Commission power to examine any existing dam, either upon complaint or upon its own initiative; and Section 5 of this act provides that if the Commission should find a dam unsafe, or in need of repair or removal, it could order the owner or owners thereof to repair or remove the same, as the exigencies of the case might require, such work to be begun and proceeded with to completion within such reasonable time as might be prescribed by the Commission. This section of the act also provides that if the owner or owners, notified as aforesaid, neglect or refuse to comply with the Commission's requirements, or if the owner or owners could not be found or determined, it devolves upon the Commission to make such repairs, or cause such removal, the cost of such work to be recovered by the Commission, in the name of the Commonwealth, from the owner or owners, in the same manner as debts are now by law recoverable. In order to provide further against the failure of a dam which appears to be dangerous to public safety, Section 6 gives the Commission power to immediately repair or remove the structure, in case, in its opinion, the condition of the dam be so dangerous as not to permit of giving notice, as provided in Section 5, to the owner or owners of the structure, and to recover the cost of such work from the owner or owners, as debts are now by law recoverable. Since the passage of this act the work of examining existing dams has been carried forward with such dispatch as is consistent with proper care.

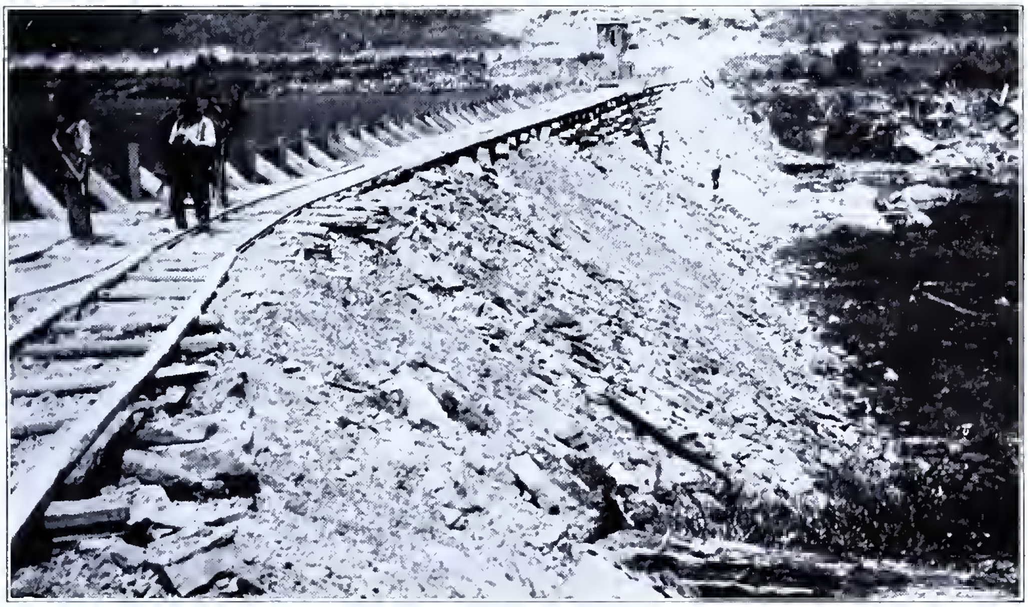
Petitions have been received requesting the investigation of dams believed to be dangerous and to threaten lives and property, and examinations are promptly made to allay the fears of the residents, or such steps taken as may be necessary to make the dams secure. Requests for examinations are sometimes received from owners of dams, who wish to assure themselves of the safety of their structures or to ascertain what changes may be necessary to meet the approval of the Commission.

There are approximately three hundred and fifty important dams in the State of Pennsylvania, the majority of which are of the earth fill type, although there are a large number of masonry and timber crib dams and a few of the hollow reinforced concrete type. The largest proportion of these dams are built for domestic and industrial water supplies, and a considerable number form ice ponds which, with a few exceptions, are small structures. Many dams have been built to impound water for the production of electric power, and for operating mills, and a few form ponds for pleasure purposes. In an examination of an existing dam effort is made to secure complete information regarding its history, design, foundation, and methods used in its construction. The larger and more important dams have been selected for the first work, since the failure of any of these would result in the greatest damage to life and property.

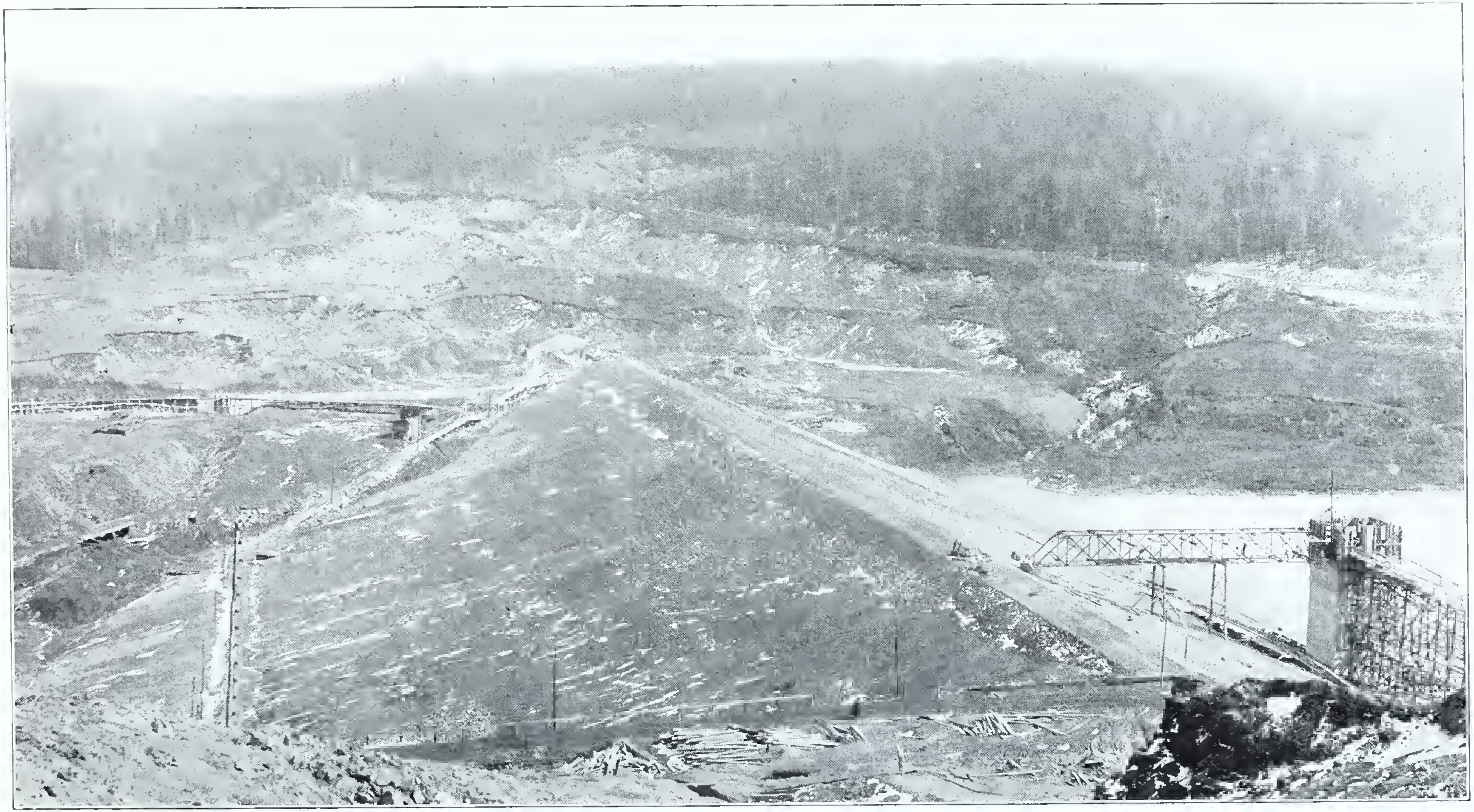
To conduct the work systematically, sections of the State which contain the greatest number of the larger and more important dams have been segregated into districts, by plotting on a map of the State the location of all known dams. There are four regions in the Commonwealth, centers of industrial activity, near the headwaters of the large rivers, and therefore making storage economically necessary for both domestic and industrial supplies. An Assistant Engineer has been assigned to each of these districts, who is made responsible for locating all dams therein, and who examines them and reports thereon to the Engineer of the Commission. A complete survey of the remaining portions of the State, and examinations of the dams scattered therein, will follow. The four districts above mentioned are:—

1. North Eastern District—Lackawanna, Luzerne, and Carbon counties.
2. South Eastern District—Schuylkill, Berks, Columbia, and Northumberland counties.
3. Central District—Blair, Cambria, and Somerset counties.
4. South Western District—Westmoreland and Fayette counties.

The course ordinarily pursued in the examination of an existing dam is to secure the plans, the date of construction, the names of the engineer and contractor, and information concerning the repairs which have been made and weaknesses which have developed. The engineer and contractor are visited to obtain construction data, the character of material encountered in the foundation, etc. A detailed physical examination of the structure is then made, and all points which might contribute to failure are noted, and photographs of the various features are taken. The valley below the dam is observed to determine the probable effect of a sudden rupture of the structure. The data gathered is then studied in detail, and a complete theoretical analysis of the structure made to determine its degree of stability. The drainage area tributary to the stream above the dam is considered for various conditions of rainfall to determine its probable maximum discharge, in order to compare the required and actual capacities of the spillway. A complete report is then prepared for presentation to the Commission, with recommendations. If no changes or repairs are necessary the report is received and filed,



Bayless Manufacturing Corporation—Timber Crib Dam. During Construction of Rock Fill Against the Downstream Face of Cribbing.



Manufacturers' Water Company, Quemahoning Dam.

but if the dam is obviously defective the owners are notified to make the required improvements within a specified time, subject to the approval of the Commission.

Table No. 11 shows the existing dams examined by the Commission during 1913.

TABLE NO. 11.

Examinations of Existing Dams Made in 1913, upon Complaints or upon the Initiative of the Commission.

Owner.	Location.	Date.
1. Lebanon City Water Works, ...	Dam No. 2, on West Branch, Hammer Creek, Lebanon Co.	Jan. 2.
2. Tyrone Gas and Water Company,	Sink Run, Blair Co., ...	Jan. 6.
3. Johnstown Water Company, ...	Salt Lick Creek, Cambria Co., ...	Jan. 7. July 16.
4. Bayless Pulp and Paper Company.	Freemans Run, above Austin, Potter Co.,	Jan. 29.
5. Punxsutawney Water Company, ..	Clover Run, Jefferson Co., ...	Jan. 30.
6. Mountain Ice Company, ...	Pocono Lake, Tobybanna Creek, Monroe Co.	Feb. 7. Aug. 7. Oct. 15.
7. Dauphin Consolidated Water Co.,	Stony Creek, Dauphin Co..	Feb. 13.
8. W. S. Palmer, ...	Dalton Run, near Gleuburn, Lackawanna Co.	April 18.
9. Erie Railroad Company, ...	Hathaway Pond, Lackawanna River, Susquehanna Co.	April 19. Oct. 14.
10. Erie Railroad Company, ...	Lewis Lake, near Uniondale, Susquehanna Co., tributary of Lackawanna River.	April 19. Oct. 14.
11. American Ice Company, ...	Perkiomen Creek, Montgomery Co., ...	April 24.
12. K. S. Miller, ...	Hagerman Run, South Williamsport, Lycoming Co.	May 8. Oct. 9.
13. Beaver Falls Water Power Co., ..	Beaver River, Beaver Co., ...	July 15.
14. Middle Creek Electric Company,	Middle Creek, near Selinsgrove, Snyder Co.,	Aug. 4.
15. Susquehanna County Electric Co.,	Pages Pond, Salt Lick Creek, Susquehanna Co.	Aug. 6.
16. Pocono Pines Ice Company, ...	Upper Tobyhanna Creek, Monroe Co., ...	Aug. 7. Oct. 15.
17. Lebigbton Water Supply Co., ...	Long Run, near Lebigbton, Carbon Co., ..	Aug 9.
18. J. M. Hosfeld, ...	Connodoguinet Creek, 9 miles N. W. of Shippensburg, Franklin Co.	Sept. 1.
19. City of Reading, ...	Bernhart Creek, Berks Co., ...	Dec. 1. Dec. 4.
20. City of Reading, ...	Egelmau Run, Berks Co., ...	Dec. 1. Dec. 4.
21. City of Reading, ...	Maiden Creek, Berks Co., ...	Dec. 1. Dec. 3.
22. City of Reading, ...	Stony Creek, Berks Co., ...	Dec. 1. Dec. 3.
23. Silver Creek Water Company, ..	Lower Tumbling Run, Sebuylkill Co., ...	Dec. 16.
24. Silver Creek Water Company, ..	Upper Tumbling Run, Sebuylkill Co., ...	Dec. 16.
25. Birdsboro Water Company, ...	Indian Run, Berks Co., ...	Dec. 22.
26. Silver Creek Water Company, ..	Silver Creek, Schuylkill Co., ...	Dec. 24.
27. Reading Cold Storage Company,	Angelic Creek, Berks Co., ...	Dec. 24.
28. Reading Paper Mills, ...	Tulpohocken Creek, Berks Co., ...	Dec. 24.
29. Crystal Water Company, ...	West Branch of Sebuylkill River, Schuylkill Co.	Dec. 30.
30. Pottsville Water Company, ...	Eisenhuth Run, Schuylkill Co., ...	Dec. 31.
31. Pottsville Water Company, ...	Kauffman Run, Schuylkill Co., ...	Dec. 31.
32. Pottsville Water Company, ...	Wolf Creek, Schuylkill Co., ...	Dec. 31.
33. Scranton Gas and Water Co., ...	No. 5 Dam, Stafford, Meadow Brook, Lackawanna Co.	Dec. 31.

Twenty-one of the thirty-three dams listed in Table No. 11 were examined subsequent to the passage of the new law; twenty-two were examined upon the initiative of the Commission; two upon complaint, and one upon request of the owners. The Commission has ordered the owners of eighteen of these thirty-three dams to repair and strengthen them. Ten were found to be in satisfactory condition, while the remaining five have not been disposed of. During 1914 a large proportion of the 350 important dams will be examined.

ENCROACHMENT DIVISION.

Preeminence of Pennsylvania in This Work.

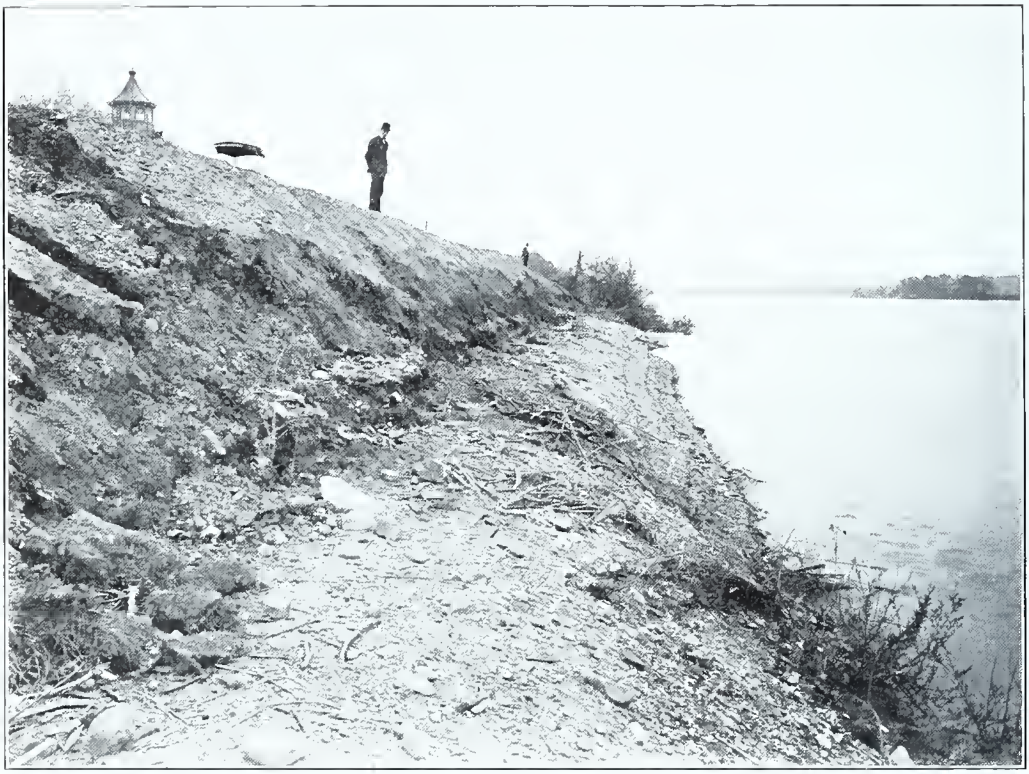
Pennsylvania has today better legislation relating to the prevention of encroachments upon stream channels than any other state. No stream channels, except those of insignificant proportions, can be reduced or altered unless the Water Supply Commission decides, from an engineering and economic standpoint, that it will not be prejudicial to the regimen of the stream. Pennsylvania was the first state to enact and enforce legislation along this line, and as a result of knowledge gained by years of experience recent laws have fully guaranteed to the people of the State protection against the continuation of the depredations previously practiced upon river and creek channels.

Previous Legislation.

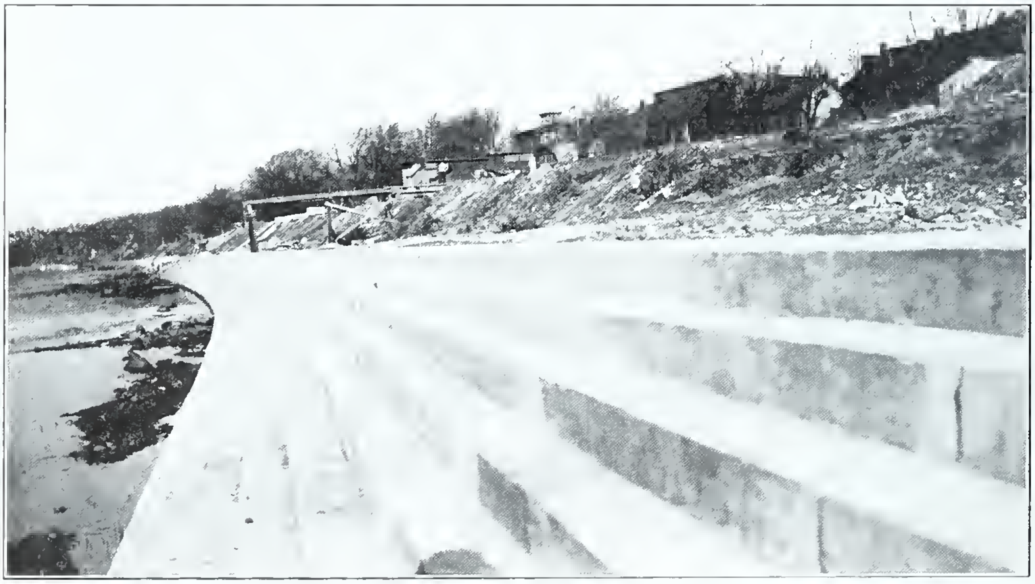
During the first years of its existence the Commission became aware of the practice, current over the Commonwealth, of encroaching upon or placing obstructions in the stream channels by constructing bridges, walls, embankments and dams therein. It was also observed that changes in channels were being made, and streams obstructed by dumping silt, slag, ashes, culm and other industrial refuse into them. The necessity of centralized control over these operations was evident, and in 1907 the Legislature enacted a law, approved May 28th, requiring the approval of the Commission before any such work could be done in or along the more important streams. The enforcement of this act developed two fundamental weaknesses, namely, the lack of general application to all streams and the absence of a penalty.

Encroachment Act of 1913.

By the Act of June 25, 1913, these defects were corrected; the supervision of the Commission was extended over practically all streams, and a heavy penalty provided for failure to comply with its provisions. This act, which provides for supervision over dams as well as other obstructions, is quoted on page 37. Its provisions cover all forms of construction, as well as the deposit of debris of any character, in or along the streams. The act also permits the Commission, upon complaint or upon its own initiative, to examine existing obstructions to determine whether they are unsafe or in need of repairs.



Erosion of Unprotected Bank of Susquehanna River, at Harrisburg.



River Wall, Protecting Bank of Susquehanna River, at Harrisburg.

Another law relating to encroachments, known as the Anthracite Culm Act, was approved June 27, 1913, and follows:

ANTHRACITE CULM ACT.

An act to preserve the purity of the waters of the State, for the protection of the public health and property.

Section 1. Be it enacted, &c., That, from and after the passage of this act, it shall be unlawful for any person, partnership, or corporation to place or discharge, or permit to be placed or discharged, in or into any of the running streams of this State, any anthracite coal, anthracite culm, or refuse from anthracite coal-mine; or to deposit any such coal or culm, or refuse upon the banks of such stream, where the same would be likely to slide into or be washed into such stream: Provided however, That this act shall not apply to waters pumped or flowing from coal-mines where the coal or culm, or refuse have been removed therefrom; or shall not prevent the discharge of sewerage from any public sewer-system, owned or maintained by any municipality in this Commonwealth.

Section 2. Any person, firm, or corporation violating the provisions of this act shall be deemed guilty of a misdemeanor, and shall upon conviction be punished by a fine of one hundred dollars for each offense, and a further fine of fifty dollars per day for each day the offense is maintained, or be imprisoned not exceeding one month, or both, at the discretion of the court.

Approved—The 27th day of June, A. D. 1913.

JOHN K. TENER.

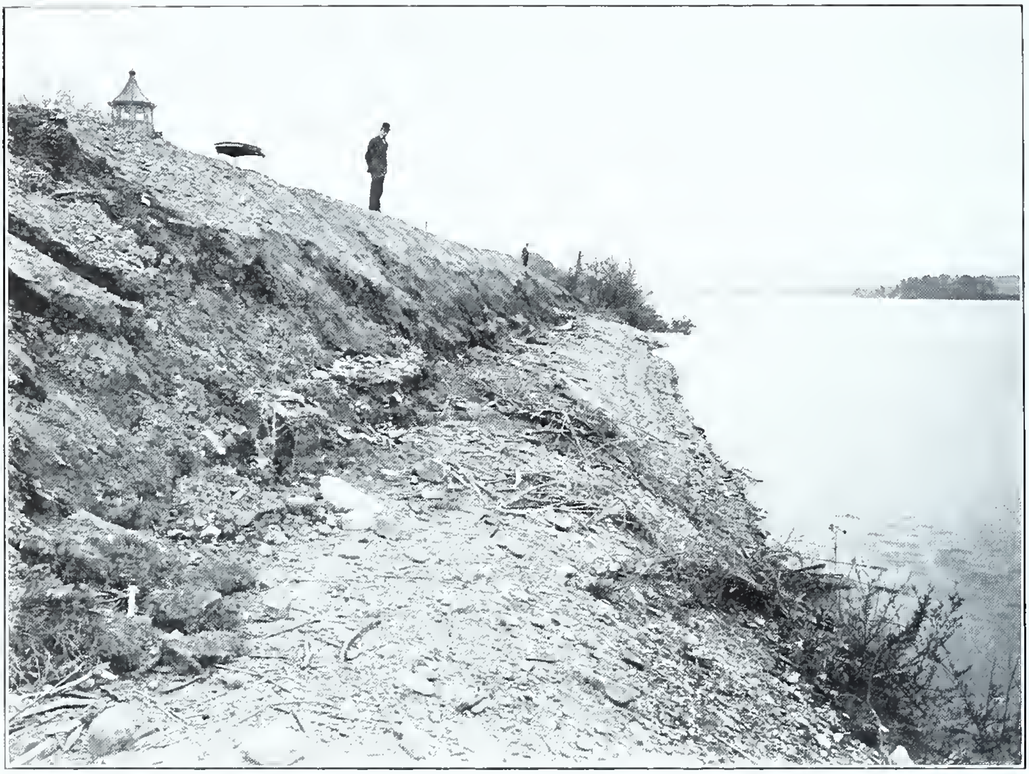
The enforcement of this act is not specifically delegated to any State department; but the courts are to act upon complaint, and as yet we know of no action being begun under it. The Commission has instituted a thorough investigation into this problem, under the Inventory Act, and intends to make suggestions and recommendations that will facilitate the improvement of the streams affected.

Results Accomplished by Encroachment Laws.

Since the enactment of the recent law, the practice of unregulated

ERRATA—Page 55.

Last paragraph, first line—304 should be 264.



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Results Accomplished by Encroachment Laws.

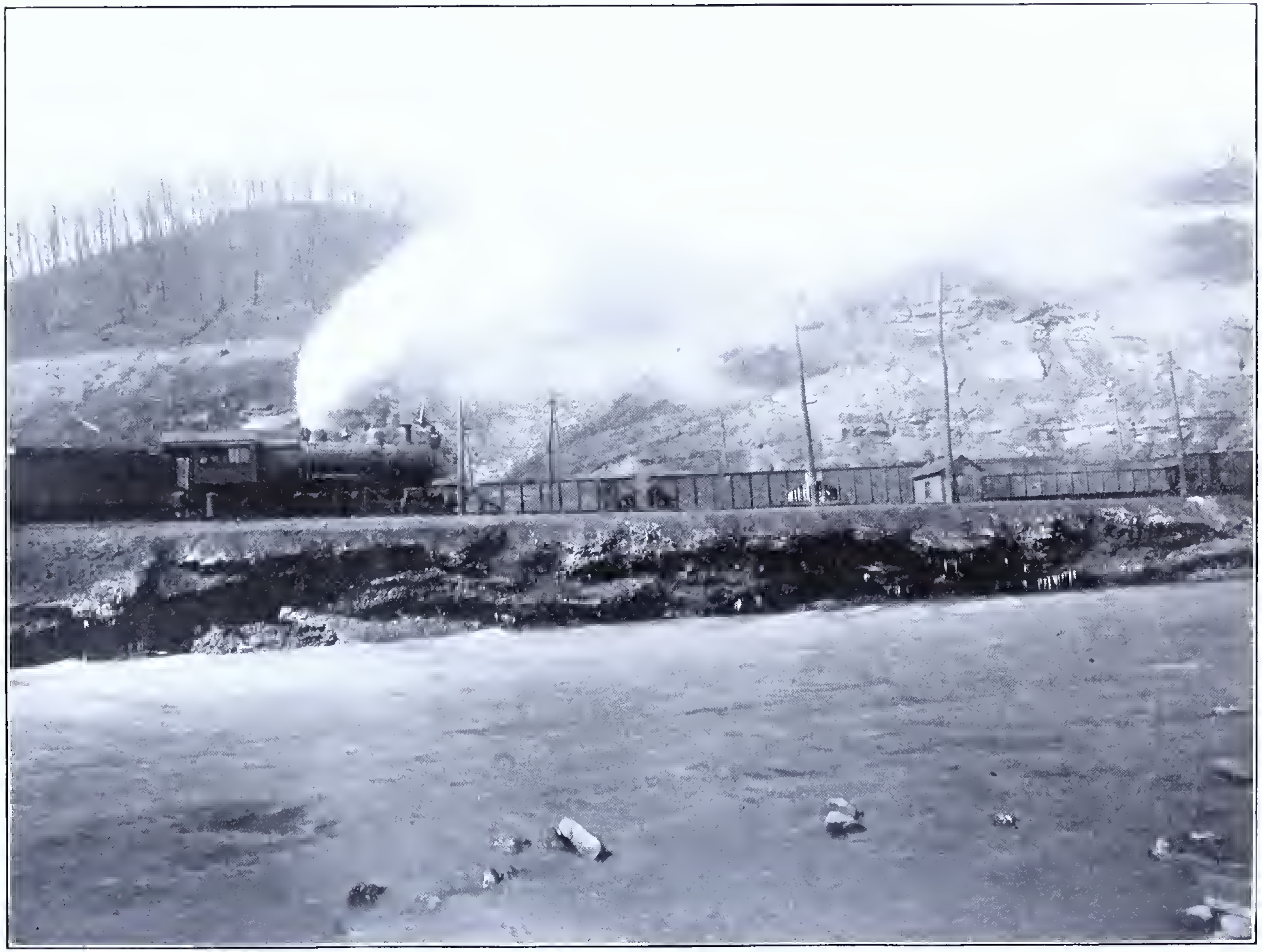
Since the enactment of the recent law, the practice of unregulated and ruthless encroachment in the streams of Pennsylvania has been stopped, and those who have been doing it in the past, largely through ignorance of consequences, are now cognizant of its dangers and of the advantage of discontinuing it. The educational value of the Commission's activities is important and far reaching.

The Commission has, in the last six years, approved 304 applications for encroachments, while others have been disapproved. The practice has been to have plans which are objectionable to the Commission amended to conform to its wishes, so that the application can be approved, rather than to refuse its approval and require a new application with amended plans. Good results have been accomplished through numerous conferences between applicants and the Engineers of the Commission, for the purpose of thus bringing plans into conformity with the Commission's ideas. Encroachments along thickly settled sections of the river valleys are the more serious ones, and benefit has resulted from preventing injurious structures at such points. Dumping of manufacturing debris into the streams has been restricted, and, it is believed, without seriously interfering with the industries. For example, quarries which have been using the rivers to get rid of small stone, overburden, etc., have been required to deposit this material on nearby areas out of reach of the streams.

The protection of many miles of river front from erosion during floods has been an important accomplishment of the Commission. When permission is granted to make a fill along a watercourse, it is the practice to require the slopes to be protected from erosion, if subject thereto, by riprap or other approved means, up to flood line. This effects permanence and prevents eroded material from being washed into the channel. Scores of miles of our river banks have been thus protected in the last few years, and as the work continues the results will become more evident. A railroad company, which has recently been increasing the number of its tracks along an important river, made application a few years ago for certain fills which would encroach upon the waterway area. After conference, it was arranged that at narrow points retaining walls should be built to reduce the encroachment to unimportant proportions, and at other points the slope should be riprapped, and these plans were approved. Subsequently, applications and plans were received from the same company covering changes in the tracks and river bank for several miles, which plans showed concrete walls and protected bank at all narrow and exposed points, and as it was found that the waterway provided was adequate these plans were approved. A company or an individual, which has had an application thus examined and passed upon, in submitting subsequent applications, usually prepares the plans in the light of previous requirements. In other words, the requirements of the Commission are being accepted and adopted widely as being beneficial to all parties concerned.

Condition of Pennsylvania Streams.

For generations Pennsylvania has permitted its streams to be used as dumping ground for waste and debris, has let railroads, industrial corporations, individuals, and municipalities encroach upon them for additional track room or for building sites, and has allowed bridges to be built which restricted the channel beyond safe limits. Today



Erosion of Slag Fill Supporting Railroad Tracks Along Conemaugh River.

the penalty is being paid in times of flood. The demands of industry were heretofore considered preeminent; but, now that river valleys are the abode of the greater part of our population, we take a different view of these operations, and believe that for the protection of the cities and of the industries located therein it is essential that encroachment upon the channels be stopped. The regimen of the rivers has changed less than has the occupancy of their valleys, and a large part of the damage done by floods today is due to the restriction of channels. Population congregates in river valleys, because industry locates there in order to be near the transportation agencies. To make these valley lands safe and suitable sites for habitation and manufacture, the river channels must be of sufficient capacity to carry the flood waters, and they cannot do this if ill-considered encroachment is permitted.

A State Function.

The protection of the channels is properly a State function, and the local authorities should assist the State therein. Each application presents a separate hydraulic problem, which requires men versed in river hydraulics to solve correctly, and each problem must be approached with a knowledge of the whole river in mind. With a full understanding between the State, municipalities and corporations as to the importance of maintaining adequate channels there will come more efficient enforcement of the law.

Neighbor States.

The states which adjoin Pennsylvania have no legislation comparable to the Pennsylvania Encroachment Law, and little is being done to prevent silt and debris from coming into Pennsylvania streams which have their sources in New York, New Jersey, Ohio, West Virginia and Maryland. These states are here urged to enact similar laws and to insist upon their enforcement. Inquiries have been recently received from two of these states relative to this matter, and it is hoped that before long there may be practical results therefrom.

Encroachment Lines.

The Commission has undertaken to set lines beyond which further encroachment cannot safely be permitted; but these lines cannot always insure sufficient channel capacity between them to carry the greatest floods without damage, because of permanent works which have been permitted in years past to occupy channel area which cannot now be recovered except at great expense.

Heretofore the main consideration in maintaining supervision over streams has been in the interest of navigation, and sometimes navigability and flood capacity are conflicting factors, for it often improves a stream for navigation to reduce the capacity of its channel. The Commission considers both of these factors in determining the lines beyond which encroachment shall not extend. Had the necessity of maintaining adequate flood channels been appreciated earlier in the industrial development of Pennsylvania, the question of controlling floods would not now be so vital.

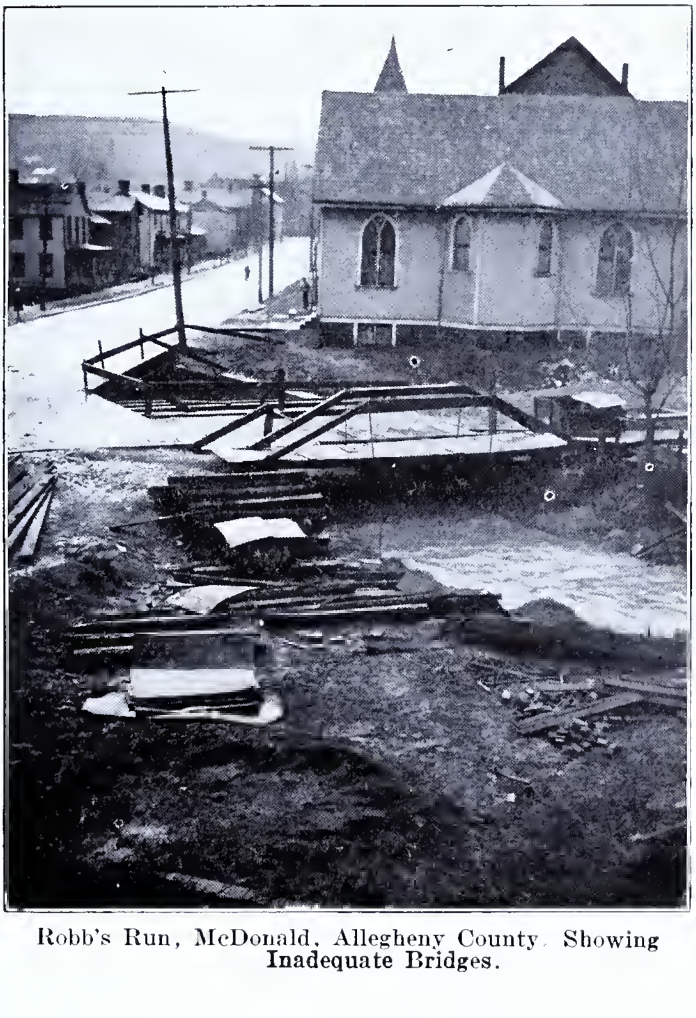
Nature and Character of Encroachments.

Encroachments may be built out from the shore, as railroad embankments; out in the channel, as bridge piers; up from the bottom, as silt deposits; or, over the top, as superstructures of bridges. Any one of these classes of encroachments may so reduce the stream channel as to render it insufficient to pass flood waters without causing overflow of banks and inundation of valuable property.

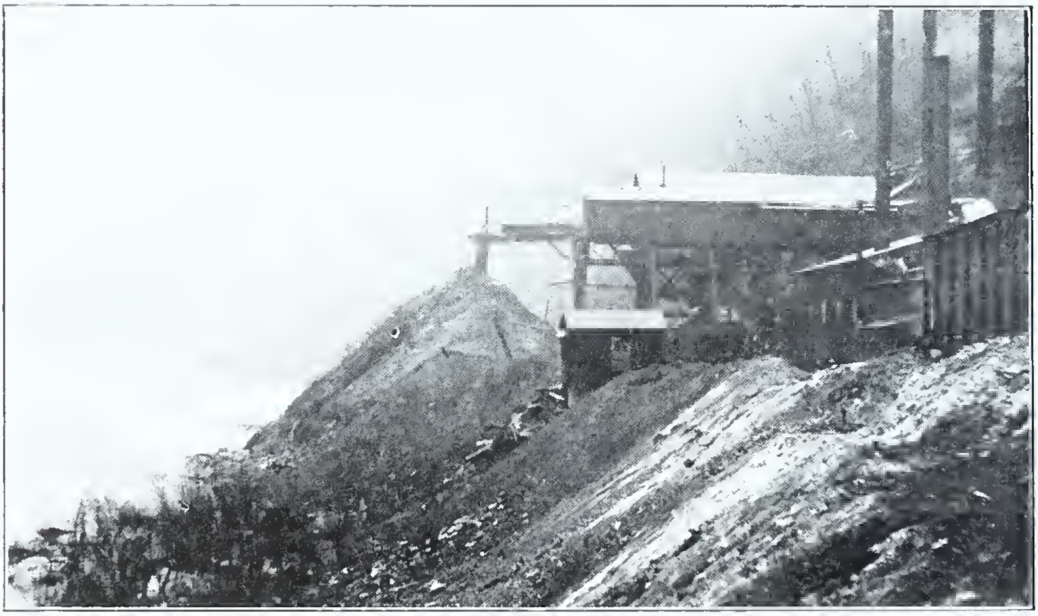
The most evident and numerous encroachments are bridges, which offer obstacles to flow in three ways: first, by piers, which reduce the area and break up the smooth sweep of the current; second, by abutments, which oftimes project out beyond the bank line; and third, by the underclearance, which in numerous instances is below flood level. The investigations by this Commission of the flood of 1913, along the Shenango River, showed that hundreds of thousands of dollars worth of damage was done in New Castle and Sharon because bridges were too small. The present tendency is to build concrete arch or plate girder bridges in place of truss structures. The latter permit water to pass through them when it rises above the underclearance, but the other two are apt to form suspended dams, which hold the water back; while the arch structures, being more permanent, are particularly menacing obstructions unless they are of ample dimensions. In approving arches, therefore, the Commission is particularly careful to secure adequate size.

The most common form to encroaching fill is the railroad embankments which follow river valleys for hundreds of miles. A water grade is always to be preferred; hence new lines, as well as old ones, usually parallel the streams. The increasing trackage requirements demand constant additions to existing lines and many new ones. To change a single track to a double track, or a double track to a four track line, requires additional right of way, and in many cases it seems desirable to obtain it on the river side, which necessitates filling out into the channel. This practice often permits of getting cheaper land and requires less costly preparation of subgrade. It also often serves as a means of disposing of waste materials.

Another kind of fill is that made by industrial corporations or individual manufacturers to obtain more room for buildings. The



Robb's Run, McDonald, Allegheny County, Showing Inadequate Bridges.



Encroachment by Mine Refuse at Coal Tipple, at Hyde Park, Armstrong County, on Kiskiminetas River.

necessary area is often obtained for the cost of filling out the bank. Where these embankments will leave ample area for flood discharge, they are usually approved, provided exposed banks are protected from erosion. When they will seriously affect the adequacy of the channel, modifications are required. Oftimes these fills smooth out irregularities in shore lines, and when completed and protected are an improvement over the original condition.

There is a general practice among the manufacturing plants situated along stream banks, to deposit their refuse in the stream, because it is carried away by floods and makes room for more. When it is carried away, however, it is deposited where the current slackens, to form shoals and islands which reduce the flood capacity at such points. This practice is not limited as above noted, but extends to cities and towns where the entire population, as well as the city government itself, seems to regard the practice of depositing all refuse in the stream as perfectly legitimate. There are few rivers and creeks in Pennsylvania which, where they pass through large or small communities, are not in a deplorable and often offensive condition through the practice of dumping all manufacturing, household, and city wastes therein. The cooperation of local authorities with the Commission is particularly useful in curtailing such practices.

There is a vast quantity of silt brought into the water courses at times of heavy rainfalls, the natural result of the erosion of the hillsides; it cannot be hoped to eliminate this, but it can be minimized through proper methods of agriculture and bank protection along the tributaries.

In addition to those described above, there are many other kinds of obstructions upon which the Commission must pass; name retaining walls, culverts, intake piers, wing walls, wharfs, ice breakers, coal hoists and tipples, piling for various purposes, foundations of buildings, etc. All of these receive careful study, and their probable effect upon the stream is determined, before action is taken.

Methods Employed.

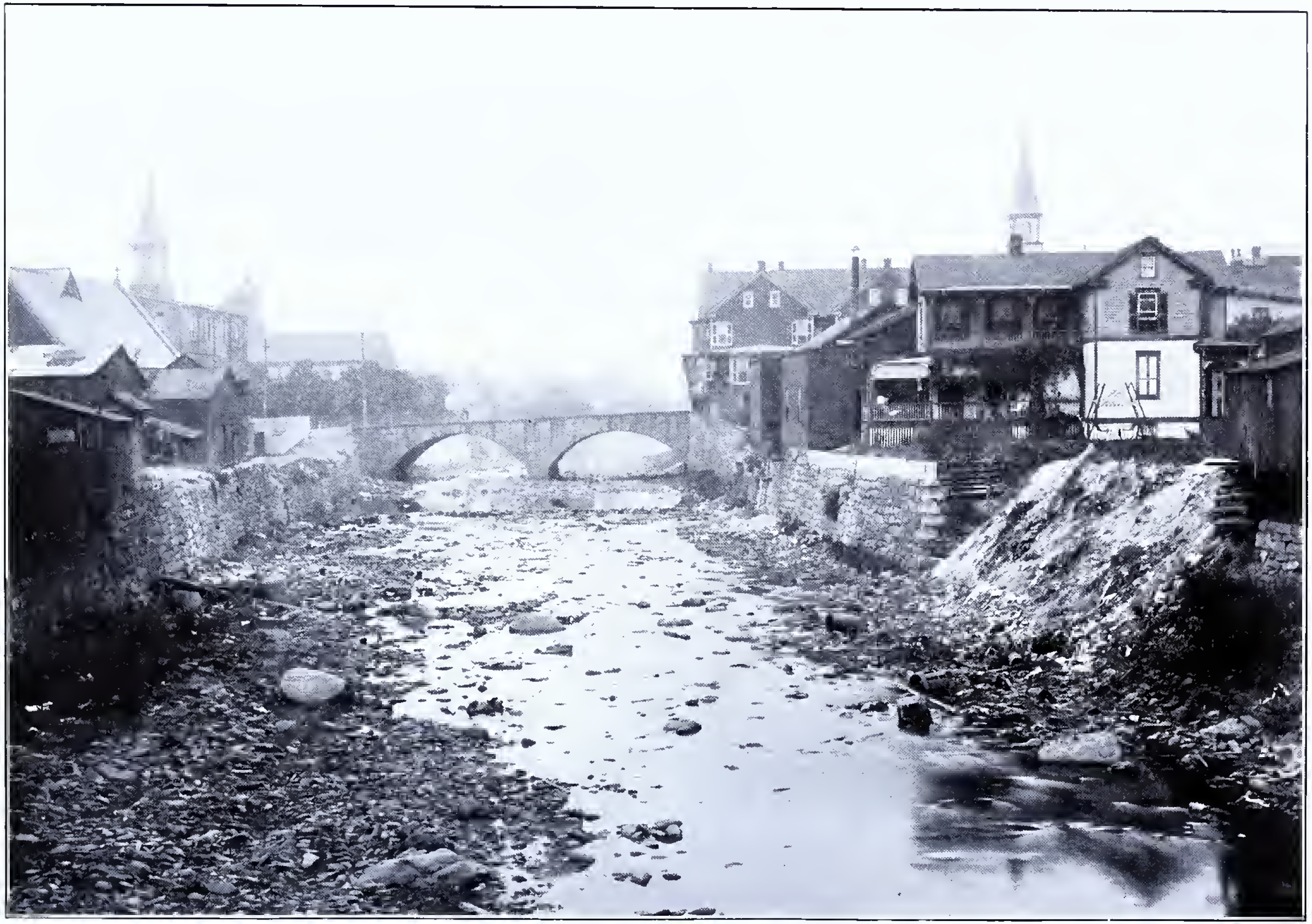
No application is acted upon unless the site of the proposed work has been examined by one of the engineering staff of the Commission, who is usually accompanied by a representatives of the applicant. Previous to the examination, an application must be filed, upon forms provided by the Commission, accompanied by plans in sufficient detail to show clearly and according to dimensions the nature of the proposed work.

Accompanying a bridge application, the Commission requires a plan and cross section at the site; and if an old structure is to be replaced with a new one, then both the old and new bridges are plotted thereon. The following information concerning the stream is also secured: length, elevation of source and mouth and at site of bridge, slope, drainage area, character of country drained, elevation of normal and flood water, character of stream bed and banks, width, and whether or not banks are overflowed. Experience with past floods at the point in question is obtained when possible. The maximum flood volume and height is estimated and whether the proposed structure will pass it. When reliable data can be obtained, or when gages have been read for long terms, this evidence is given consideration. In the absence of such data the flood discharge is computed. The capacity of the structure is dependent upon its area, number of piers, condition of the channel, and slope of the water surface. The Commission has not attempted to pass upon the design of the superstructure of bridges, nor to investigate or supervise the construction of the foundations for the substructure.

In applications for permission to make fills and embankments, much the same data is required as for bridges and culverts, with certain additions and modifications. The following gives a partial list of the information required: Complete plans and sections, showing the cross-sectional area of the existing and proposed channels entirely across the stream to the elevation of maximum high water, with flood elevation shown thereon; cross-sections of the channel above and below the proposed work; elevation of both banks; description of the country drained and of the surrounding valley, and the amount and kind of land overflowed during floods; experience with floods in that section; stream flow data, if available; which sections of the channel have the greatest velocity; full description of stream bed, including geological formation and slopes; information relative to ice conditions; slope of water surface at different stages, including flood stage, if possible; whether changes in the course of the channel are contemplated, and whether navigation improvements have been or are to be made; slopes of existing and proposed banks; material of which fill will be made, and how the slopes are to be protected; the object and purpose of the fill; protests, if any, against all, or any, sections of the fill, with names of protestants and nature of protest.

Upon the above information the areas of encroachment on the existing flood channels are computed, and the reduction in area and flood width are obtained. With this, and the stream flow data, it can be ascertained whether the proposed channel will be capable of carrying flood discharge without increasing its height beyond safe limits. A careful study is made of the material of which the fill is to be composed, and also of the protection that will be given to the banks.

The information required for other forms of encroachment include much of that required for bridges and fills, with the addition of



Tamaqua Creek, Tamaqua, Schuylkill County, Showing Deplorable Condition of Creek Channel.

shall be advised of the time of commencement of work upon the structure, and of the time of completion of the same, in order that the Commission may have the structure inspected during progress and immediately after completion, for the purpose of seeing that the plans and the conditions have been conformed with.

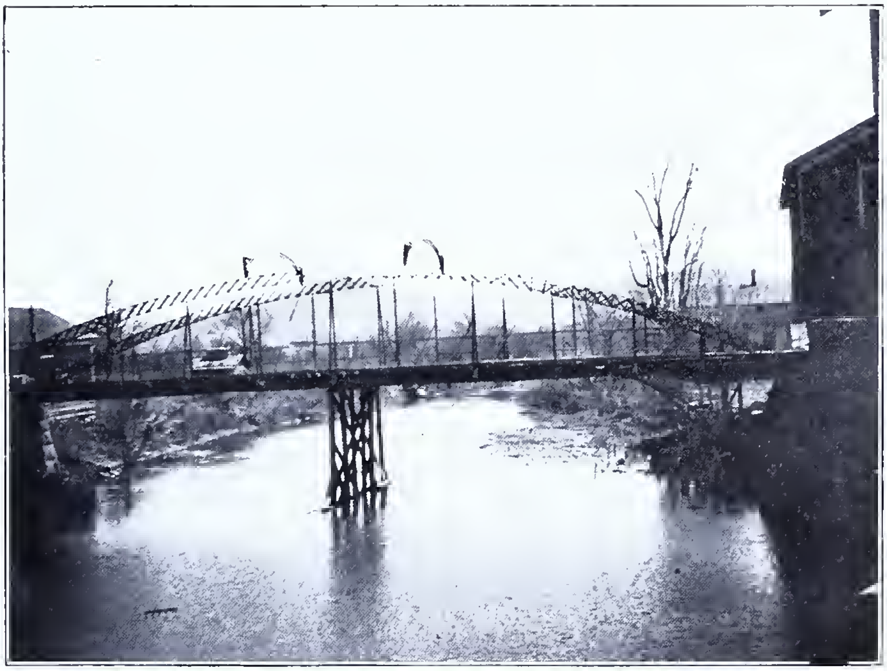
To obtain the largest carrying capacity under bridges it is necessary that the channel be as smooth and clear of obstructions as possible; and to obtain such a result the Commission attaches to most approvals of bridge applications a condition as follows: That the channel of the stream under, and for a certain specified distance above and below, the bridge, shall be cleared of all excavated material, construction debris, brush, rocks, and other refuse; the same to be deposited beyond the reach of flood waters, and the channel to be maintained in this condition.

In some cases a certain amount of excavation is required under, below and above the bridge, in order to obtain a larger area or to make the area under the bridge capable of carrying a greater discharge.

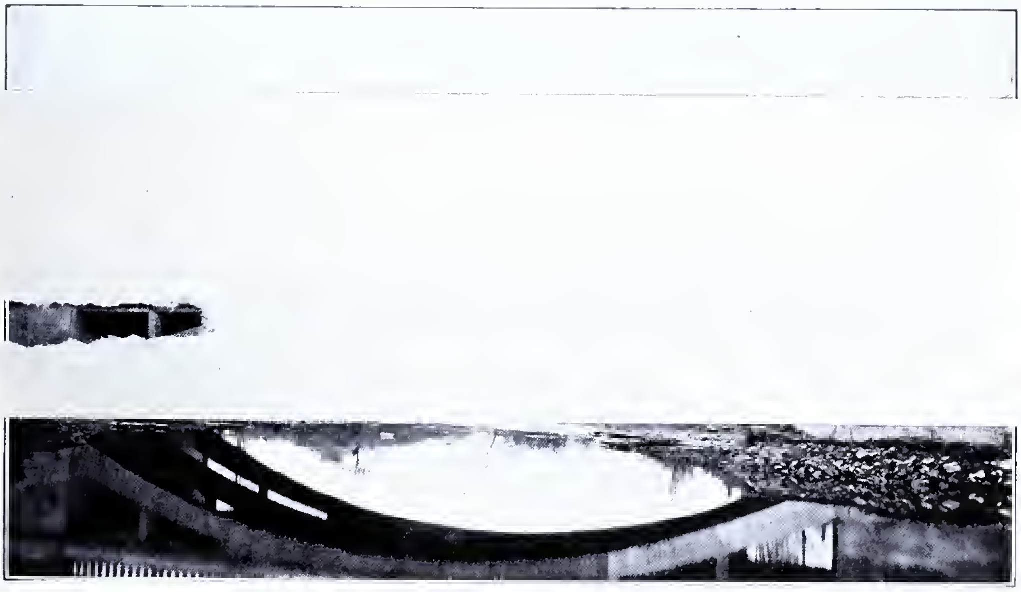
Where bridges are to be built over main rivers which the Commission considers may be at some future time improved for navigation, it is required that the applicant agree, in the event of improvement by State or Federal Government, to provide at its own expense an approved method for the passage of boats.

To the approval of all applications for the construction of railroad bridges the following condition is attached: That the applicant shall ascertain and agree to the sanitary requirements of the Department of Health of this Commonwealth relative to the use of the proposed structure, and that said applicant shall comply with the same to the satisfaction of said department.

In Table No. 13 the applications which have been approved by the Commission during 1913 are listed, comprising 111 bridges and culverts, 7 fills and embankments, and 28 miscellaneous structures.



Old Bridge Over Marvin Creek, in Smethport, McKean County.



New Bridge, Which Replaced Structure Shown Above.

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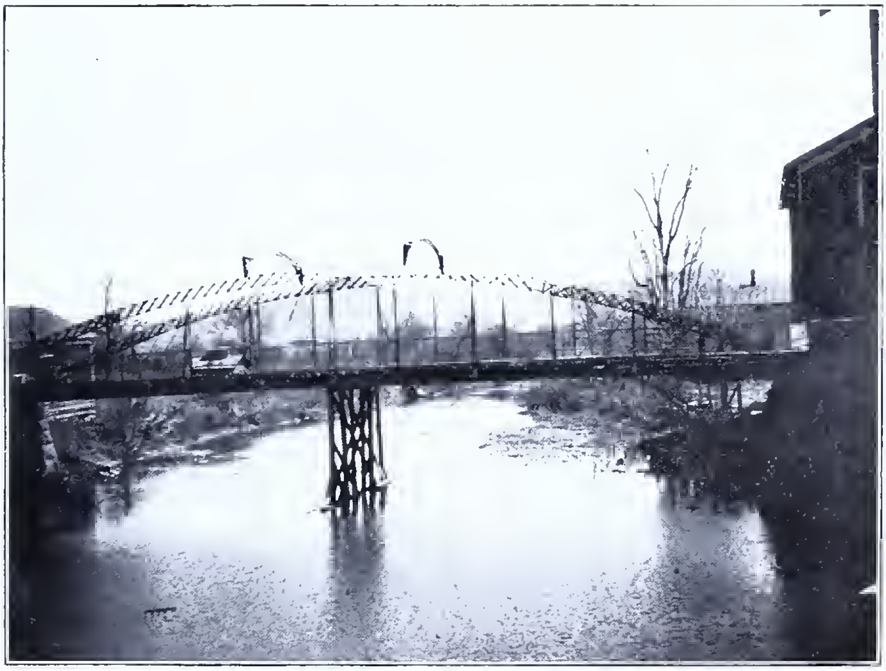
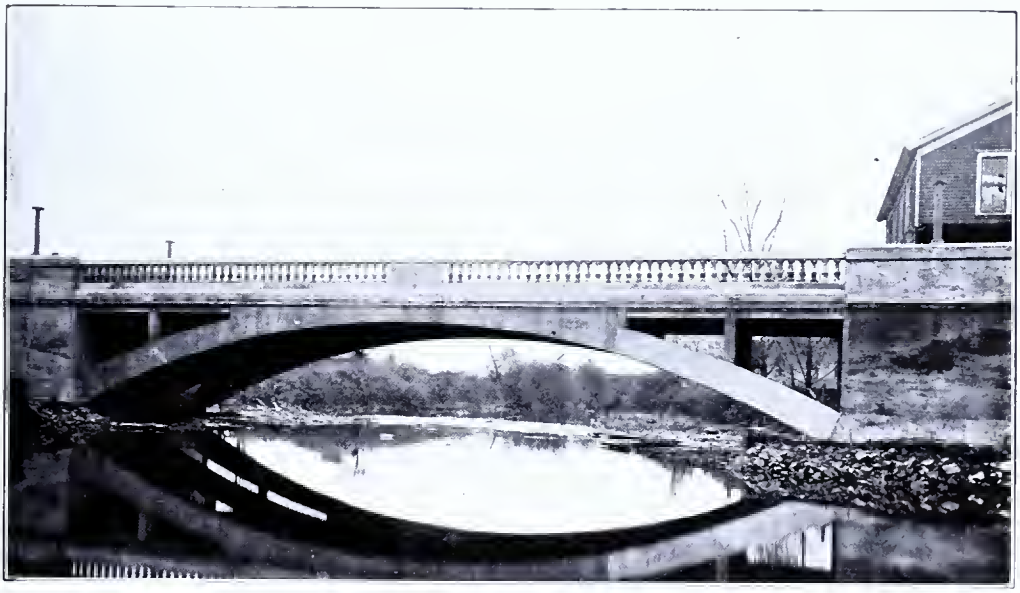
ERRATA—Page 62.

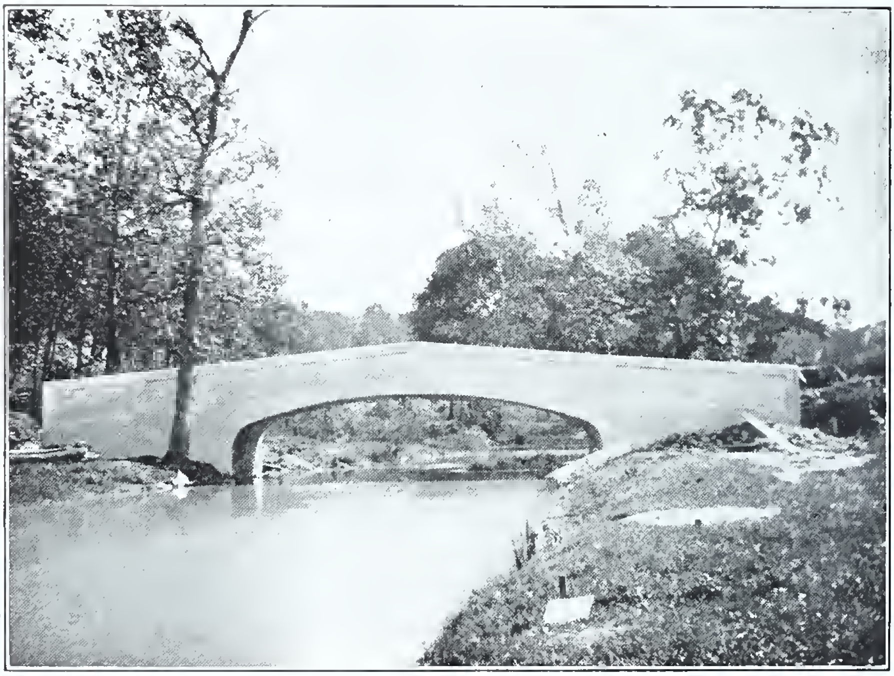
Last paragraph, second line—111 should be 109.



Old Bridge Over Marvin Creek, in Smethport, McKean County.



New Bridge, Which Replaced Structure Shown Above.



Heidelberg Bridge, Over Oil Creek, York County, Showing Adequate Waterway and Clear Channel.

TABLE NO. 13.

Encroachment Applications Approved During 1913, In Chronological Order of Approval.

BRIDGES.

Applicant.	Stream.	Location.	Date Approved.
Connecting Railway Company,	Schuylkill river,	Philadelphia,	January 21st.
Commissioners of Delaware county,	Chester river,	Chester,	January 21st.
Commissioners of Bradford county,	Susquehanna river.	Athens,	February 25th.
Commissioners of Bradford county,	Susquehanna river,	Towanda,	February 25th.
Commissioners of Westmoreland county,	Loyalhanna creek,	Latrobe,	March 20th.
Commissioners of Luzerne county,	No. Br. Susquehanna river,	Pittston,	March 20th.
Buffalo, Rochester and Pittsburgh Ry. Company.	Yellow creek,	Centre township, Indiana county,	March 20th.
Buffalo, Rochester and Pittsburgh Ry. Company,	Yellow creek,	Centre township, Indiana county,	April 8th.
Commissioners of Bucks county.	Durham creek,	Durham township,	April 8th.
John Coleman Lumber Company,	Tionesta creek,	Tionesta.	April 8th.
Beaver and Ellwood Railroad Company,	Beaver river,	West Ellwood Junction. Beaver county,	April 22d.
Wilkes-Barre Connecting Railroad Company,	Susquehanna river,	Wilkes-Barre,	April 22d.
Lancaster and Quarryville Railroad Company,	Conestoga creek,	Lancaster,	April 22d.
Borough of Ridgway,	Elk creek,	Ridgway, Elk county,	April 22d.
Wheeling, Pittsburgh and Baltimore R. R. Co.,	Monongahela river,	Glenwood,	April 22d.
Commissioners of McKean county,	Marvin creek,	Smethport,	May 6th.
Commissioners of Northumberland county,	Shamokin creek,	Mt. Carmel,	May 6th.
Philadelphia, Baltimore and Washington R. R. Co.,	Naylor's run,	Upper Darby township, Delaware county,	May 6th.
City of Philadelphia and County of Delaware,	Darby creek,	Philadelphia,	May 6th.
Pennsylvania Railroad Company.	Schuylkill river,	West Brunswick and So. Manheim townships, Schuylkill county.	May 6th.
Pennsylvania Railroad Company,	French creek,	Phoenixville, Chester county,	May 6th.
Chambersburg and Shippensburg Railway Company,	Conococheague creek,	North of Chambersburg,	May 6th.
Commissioners of Jefferson county,	Sandy Lick creek.	Reynoldsville,	May 15th.
Commissioners of Berks county,	Tulpehocken creek,	Marion township,	June 6th.
Philadelphia, Newtown and New York R. R. Co.,	Pennypack creek,	Near Huntingdon Valley station,	June 6th.
Philadelphia and Reading Railway Company,	Schuylkill river,	South of Auburn, Schuylkill county,	July 15th.
Commissioners of Fayette county,	Monongahela river,	Brownsville,	July 15th.
Commissioners of Indiana county,	Two Lick creek,	Near Coral, Centre township,	July 15th.
Commissioners of Union county,	Rapid run,	Hartley township,	July 15th.
Commissioners of Union county,	Black run,	Buffalo township,	July 15th.
Commissioners of Centre county,	Elk creek,	Millheim,	July 15th.
Northern Central Railway Company,	Wiconisco creek,	East of Millersburg, Dauphin county,	July 15th.
Northern Central Railway Company,	Gertys run,	West of Halifax, Dauphin county,	July 15th.
Pennsylvania Railroad Company,	White Thorn creek,	West of Glen Iron, Union county,	July 15th.
Commissioners of Indiana county.	Crooked creek,	Rayne township,	July 15th.
Pennsylvania Railroad Company,	Conewago creek.	Falmouth, Lancaster county,	July 15th.
Commissioners of Chester county,	Beaver creek.	East Brandywine township,	July 15th.
Commissioners of Chester county,	Bridge over Pine creek,	West Pikeland township,	July 15th.

BRIDGES—Continued.

Applicant.	Stream.	Location.	Date Approved.
Commissioners of Montgomery county,	West Branch of Perkiomen creek,	Douglass township,	July 15th.
Philadelphia, Newtown and New York R. R. Co.,	Pennypack creek,	East of Bryn Athyn, Montgomery county,	July 15th.
Borough of DuBois,	Sandy Lick creek,	DuBois, Clearfield county,	July 15th.
Commissioners of Lehigh county,	Catasauqua creek,	Near Catasauqua,	July 31st.
Commissioners of Chester county,	Branch of White Clay creek,	London Britain township,	July 31st.
Coleman, Harter and McCormick,	Tionesta creek,	Near Tionesta, Forest county,	July 31st.
Commissioners of Blair county,	Bald Eagle creek,	Snyder township,	August 26th.
Commissioners of Blair county,	Little Juniata river,	Bellwood, Antis township,	August 26th.
Commissioners of Blair county,	Juniata river,	Near Spring Meadow, Allegheny township,	August 26th.
Commissioners of Wayne county,	Lackawaxen river,	Honesdale,	August 26th.
Commissioners of Wayne county,	Dyberry creek,	North of Honesdale,	August 26th.
Gurney Elevator Works and Dexter, Lambert and Co.,	Lackawaxen river,	Honesdale,	August 26th.
Lehigh Valley Transit Company,	N. E. Br. of Perkiomen creek,	South of Sellersville, Bucks county,	August 26th.
Commissioners of Columbia county,	Roaring creek,	Slabtown,	August 26th.
Supervisors of Quincy township, Franklin county,	Nunnery creek,	On Quincy-Waynesboro road,	August 26th.
Commissioners of Allegheny county,	Little Bull creek,	North of Birdville, Fawn township,	September 9th.
Commissioners of Allegheny county,	Plum creek,	Northeast of New Texas, Plum township,	September 9th.
Commissioners of Allegheny county,	Plum creek,	North of New Texas, Plum township,	September 9th.
Supervisors of Gilpin township, Armstrong county,	Guffey run,	Near Leechburg,	September 9th.
Supervisors of Rostraver township, Westmoreland Co.,	Pollock's run,	Two miles above mouth of run,	September 9th.
Pittsburgh and Lake Erie Railroad Company,	Big run,	New Castle,	September 9th.
Commissioners of Cambria county,	Chest creek,	Patton,	September 9th.
Commissioners of Lawrence county,	Hickory creek,	Bessemer,	September 9th.
Commissioners of Butler county,	Breakneck creek,	Evansburg,	September 17th.
Supervisors of McCalmont township, Jefferson county, and Commissioners of Jefferson county,	Big run,	McCalmont township,	September 17th.
Supervisors of Washington township, Jefferson county, and Commissioners of Jefferson county,	Horam run,	Washington township,	September 17th.
Commissioners of Lawrence county,	Mahoning river,	Hillesville, Mahoning township,	September 17th.
Commissioners of Blair county,	Poplar run,	Near Claysburg, Greenfield township,	September 17th.
Commissioners of Mifflin county,	New Lancaster creek,	Armagh township,	September 30th.
City of Philadelphia,	Tacony creek,	Tabor street,	September 30th.
Commissioners of Blair county,	Fill run,	Snyder township,	September 30th.
Commissioners of Allegheny county,	No. Br. Robinson's run,	Near Oakdale, North Fayette township,	October 20th.
Commissioners of Lackawanna county,	High Falls creek,	Ransom township,	October 20th.
Commissioners of Columbia county,	Little Fishing creek,	Near Millville,	October 20th.
Elizabeth F. Brown and Grace F. Stine,	Chillisquaque creek,	Northumberland county,	October 20th.
Supervisors of Beaver township, Clarion county,	Deer creek,	Beaver Furnace,	October 20th.
Commissioners of Cumberland county,	Connodoguinet creek,	Near Carlisle,	October 20th.
Commissioners of Butler county,	Bear creek,	Near Bruin, Parker township,	October 20th.
Supervisors of Farmington township, Clarion county,	Toms run,	On Cooksburg-North Pine Grove road,	October 20th.
Commissioners of Blair county,	Halter creek,	Taylor township,	October 20th.
Commissioners of Blair county,	Roaring Spring run,	Blair township,	October 20th.

Commissioners of Blair county,	Halter creek,	Near Rodman Furnace, Taylor township,	October 20th.
Commissioners of Blair county,	Poplar run,	Puzzletown,	October 20th.
Commissioners of Blair county,	Sink run,	Reservoir park, near Tyrone,	October 20th.
Commissioners of Blair county,	Riggles run,	Antis township,	October 20th.
Commissioners of Northumberland county,	No. Br. of Shamokin creek,	Near Green Ridge, Mt. Carmel township,	October 20th.
Commissioners of Lancaster county,	Peters creek,	Dorsey's Mill, Fulton township,	October 20th.
Commissioners of Berks county,	Bieber creek,	Rockland township,	November 12th.
Commissioners of Berks county,	Swamp creek,	Bechtelsville,	November 12th.
Commissioners of York county,	Orson run,	Lower Chanceford township,	November 12th.
Commissioners of Mercer county,	Gillis run,	West Salem township,	November 12th.
Commissioners of York county,	Fishing creek,	Windsor,	November 12th.
Rohrerstown, Landisville and Mt. Joy Street Railway Company.	Little Conestoga creek,	West of Lancaster,	November **12th.**
Commissioners of York county,	Oil creek,	Heidelberg township,	November 12th.
Commissioners of Westmoreland county,	Loyalhanna creek,	Loyalhanna township,	November 12th.
Commissioners of Delaware county,	Chester creek,	Thornbury township,	November 12th.
Commissioners of Lancaster county,	Pequea creek,	New Milltown,	November 12th.
Commissioners of York county,	West Br. Codorus creek,	Codorus and Manheim townships,	November 12th.
Commissioners of Chester county,	So. Br. French creek,	Warwick and East Nantmeal townships,	December 4th.
Pennsylvania Railroad Company,	Ritchey run,	Emlenton,	December 4th.
Commissioners of York county,	Codorus creek,	New Freedom,	December 4th.
Commissioners of York county,	Barshingers Mill creek,	York and North Hopewell townships,	December 4th.
Commissioners of Allegheny county,	Chartiers creek,	McKees Rocks,	December 4th.
Pennsylvania Railroad Company,	Frankford creek,	Frankford, Philadelphia,	December 4th.
Fayette City borough,	Nauvoo Hollow creek,	Fayette City,	December 4th.
Pennsylvania Railroad Company,	Allegheny river,	Kiskiminetas Junction,	December 9th.
West Virginia Pulp and Paper Company,	Frankstown Br., Juniata river,	Near Williamsburg, Blair county,	December 9th.
Pennsylvania Railroad Company,	Adams run,	Centre county,	December 18th.
Supervisors of Bigler township, Clearfield county,	Alexander run,	Madera,	December 18th.
Monongahela Railroad Company,	Monongahela river,	New Geneva, Fayette county,	December 18th.

FILLS.

Pennsylvania Railroad Company,	Allegheny river,	Near Foxburg, Emlenton, Brandon, Foster and Prentice, Clarion and Venango counties.	February 25th.
Beech Creek Extension Railroad Company,	West Br. Susquehanna river,	Between Keating and Lock Haven,	February 25th.
Pennsylvania Railroad Company,	Allegheny river,	Near Hooks and Lower Hillville, Armstrong and Clarion counties.	March 20th.
Lorain Steel Company,	Stony creek,	Johnstown,	April 22d.
Wilkes-Barre Connecting Railroad Company,	North Br. Susquehanna river,	Dorrancetown,	May 6th.
New York, Susquehanna and Western R. R. Co.,	McMichael's creek,	Stroudsburg,	August 26th.
Pennsylvania Railroad Company,	Lt. Conemaugh river,	Near Mineral Point, Cambria county,	October 20th.

MISCELLANEOUS ENCROACHMENTS.

Applicant.	Stream.	Nature of Encroachment.	Location.	Date Approved.
Commissioners of Allegheny county,	Allegheny river,	Riprap,	Around bridge pier, Oakmont,	February 25th.
Commissioners of Allegheny county,	Allegheny river,	Riprap,	Around bridge pier, Pittsburgh,	February 25th.
Struthers-Wells Company,	Allegheny river,	Wall,	Warren,	February 25th.
Northumberland County Gas and Electric Company,	Susquehanna river,	Pipe line,	Upper Augusta township,	April 8th.
Northumberland County Gas and Electric Company,	Penns creek,	Pipe line,	Monroe and Penn townships,	April 8th.
Lehigh Valley Railroad Company,	Lehigh river,	Bridge pier,	Glen Onoko, Carbon county,	April 8th.
Norristown Power Company,	Schuylkill river,	Power plant,	Norristown,	June 6th.
Bessemer Coke Company,	Cats run,	Wall,	Nicholson township, Fayette county,	July 15th.
Consolidated Connellsville Coke Company,	Cats run,	Wall,	Nicholson township, Fayette county,	July 15th.
City of Harrisburg,	Susquehanna river,	Wall,	Harrisburg,	July 15th.
Jones and Laughlin Steel Company,	Ohio river,	Coal hoist, ice breakers, etc.	Beaver county, 17 miles below Pittsburgh.	July 15th.
Borough of DuBois,	Sandy Lick creek,	Channel change,	DuBois, Clearfield county,	July 15th.
Pennsylvania Railroad Company,	Driftwood Br. Sinnemahoning creek.	Channel change,	Between Sterling Run and Cameron,	July 31st.
Reading Iron Company,	Schuylkill river,	Culvert,	Reading,	August 26th.
Borough of Warren,	Allegheny river,	Wall,	Warren (south bank of stream),	August 26th.
Borough of Warren,	Allegheny river,	Wall,	Warren (north bank of stream),	August 26th.
Borough of Warren and Daughters of American Revolution.	Allegheny river,	Wall,	Warren (south bank of stream),	August 26th.
Jones and Laughlin Steel Company,	Monongahela river,	Coal hoist,	Pittsburgh,	September 9th.
Jones and Laughlin Steel Company,	Monongahela river,	Piling,	Pittsburgh,	September 9th.
Duquesne Light Company,	Ohio river,	Dock,	Brunot Island, Allegheny county,	October 20th.
Susquehanna Silk Mills,	Susquehanna river,	Storing stone,	Sunbury, Northumberland county,	October 20th.
Commissioners of Allegheny county,	Allegheny river,	Riprap,	Around bridge piers, Pittsburgh,	October 20th.
Crucible Steel Company,	Allegheny river,	Coal wharf,	Pittsburgh,	October 20th.
American Sheet and Tin Plate Company,	Shenango river,	Intake,	New Castle,	October 20th.
Commissioners of Indiana county,	Lt. Mahoning creek,	Bridge pier,	West Mahoning township,	November 12th.
Jones and Laughlin Steel Company,	Ohio river,	Breakwater,	Beaver county, 17 miles below Pittsburgh.	December 4th.
Pennsylvania Railroad Company,	Tidioute creek,	Channel change,	Tidioute, Warren county,	December 18th.
Fredericktown Coal and Coke Co.,	Monongahela river,	Tipple, piling, etc.,	Fredericktown,	December 18th.

Conclusions and Recommendations.

Six months operation under the new act has not developed many criticisms thereof. The broad scope increases the work, but permits of accomplishing correspondingly greater results. The force under the direction of the Commission has been increased, and the experience gained makes each individual assistant of greater value to the State. It will be necessary, however, if the applications are to be examined and reported upon promptly, that larger appropriations be made by the Legislature of 1915.

It is also believed that the establishing of fixed river or bank lines through congested and thickly populated sections, beyond which no encroachments are to be permitted, is absolutely essential. Thus all the interests involved would know where encroachments can and where they cannot be made, and the comprehensive study will determine the matter of encroachments permanently for each section. To properly set such lines, it may be, and probably would be, necessary to remove some existing projections. It is recommended that a law definitely directing the establishing of such lines, at such points as the Commission may prescribe, be enacted by the Legislature of 1915.

CHAPTER IV.

PYMATUNING SWAMP RESERVOIR PROJECT.

Introduction.

A special report was made to the Legislature of 1913 upon the feasibility of constructing a storage reservoir in Pymatuning Swamp, Crawford County, on the headwaters of the Shenango River, for the purpose of improving the dry weather flow and of ameliorating floods. This report was also printed as an appendix of the 1912 regular report of the Commission. In it the history of the project and previous legislation are discussed and the conclusion reached that this reservoir is essential to the future prosperity of the Shenango Valley; that it is feasible, and will cost, including the land, $1,600,000.

As a result of these conclusions, and the recommendations of the Commission that this reservoir be built at an early date, the Legislature of 1913 passed an act (see page 71) placing the necessary powers and duties in the hands of the Water Supply Commission and directing the construction of the reservoir. The act carried an appropriation of $400,000 to begin work; but, owing to insufficient revenue, the Governor was forced to reduce the appropriation to $100,000, which sum was not adequate to warrant the beginning of construction, and attention has been devoted to increasing the scope of the plans, surveying properties, collecting hydraulic data and making a detailed estimate of cost.

Section 1 contains the direct authority to construct a dam across the outlet of Pymatuning Swamp to regulate the flow of water in the Shenango and Beaver rivers.

Section 2 gives the Commission power to acquire by purchase or condemnation, such lands and materials as are necessary.

Section 3 outlines the method of condemning land or materials.

Section 4 states that, after the entire cost of land and materials has been ascertained as nearly as may be, possession may be taken after 60 days notice.

Section 5 gives the Commission power to remove, relocate or otherwise change telegraph, telephone, railway, electric light, power or other lines, water or gas pipes, etc., and, if agreement cannot be reached with owners, to do the work, the damages being fixed as in condemnation proceedings.

Section 6 provides for approval of all titles to land by the Attorney General.

Section 7 provides for the maintenance of the reservoir, at the expense of the Commonwealth, by the Water Supply Commission.

Section 8 makes an appropriation for the purchase of land and construction of the dam, and also provides that no land shall be purchased until waivers of all damages from owners of land in Ohio, to be submerged, shall be filed.

Property Surveys.

To determine the probable cost of the land, with the detail and accuracy desired, and also to facilitate taking of options when the time came for that, it was evident that accurate property surveys would be necessary, and this work was undertaken as soon as the field party was organized. The act was approved July 25th, and on September 1st the field work began. Headquarters were established on November 1st in a house, rented for the force at Westford, Crawford County.

The reservoir will flood 24.7 square miles of land, of which about one-half is swamp, and it is divided into about 400 parcels, each of which had to be run out by chained traverse lines around its boundary. The boundaries of some of the properties were found to have been poorly described and defined, so that it was most difficult to follow them on the ground, especially in the almost impenetrable portions of the swamp. It was necessary to wait for cold weather when the swamp was frozen to locate such sections. In the onion lands, near Linesville, it is deemed advisable to survey these small parcels during the planting of the crops in the early spring. It is expected that the property surveys will be completed early in the summer of 1914, when each property will be plotted on a separate map, with the buildings marked thereon.

Flow Line.

Following the completion of these surveys, it is the purpose to run out the flow lines of the reservoir by accurate levels, marking the border of the lake on all property fences on the ground, as their accurate location is essential in the purchase of the properties bordering the reservoirs. Some of these properties will be almost under water, leaving only a small part above the flow lines, and such properties should be bought entire; from others only a small part will be needed and only that portion which will be flooded will have to be acquired. The owners should know, therefore, both on the ground and on maps, exactly what portion of their property will be wanted, in order that they and we may fairly estimate the value of that portion.

Property Description.

Descriptions of each property will be obtained either from the Recorder of Deeds office at Meadville, Pa., and at Andover, Ohio, or from the owner, when parcels have not been recorded and previous selling prices noted.

Timber Survey.

There is a large amount of standing timber on this area, some of which is of commercial value, while some will cost more to remove than it is worth. Following the completion of the property surveys, a timber survey will be made by which an accurate estimate will be obtained of the value of the timber on each property and of the cost of its removal and salvage therefrom.

Buildings.

Photographs will be taken of all buildings, and estimates of the value thereof made by personal examination.

Dam.

In 1912 an exploration was made of the dam site by borings, and a log was kept of the materials encountered in the seven holes which were drilled. A design of an earthen dam, with concrete spillway founded on rock, was made and an estimate of cost prepared. During 1914 it is proposed to thoroughly investigate the dam site by dry borings and to prepare plans in sufficient detail for the construction of the dam. Plans for relocation of highways, changes in grades of railroads, and other construction features will also be prepared.

Hydrographic Studies.

The gaging stations at Sharon and Turnerville on the Shenango River have been maintained through the year and the discharge data are given on page 290 of this report. The old timber crib dam at Sharpsville, three miles above Sharon, has been repaired, a sharp level crest placed thereon, and an automatic recording gage installed, in order to give an accurate weir measurement as a check on the flow of the Sharon gage. A weir was also built at the Turnerville bridge and an automatic gage installed near the dam site; and it is proposed to establish gages on the tributaries of the Shenango River which enter it below the dam site, for the purpose of determining accurately the quantity of water coming into the river between the dam and Sharon. These data will be necessary in the operation of the reservoir.

Rain Gages.

Rain gages were operated at Linesville and Turnersville during 1912 and 1913, and new gages were installed at Westford, Hadley, and Orangeville. It is proposed to place additional rain gages on the drainage areas of tributary streams above the proposed stream gaging stations referred to.

Evaporation Tanks.

Evaporation tanks were operated at Linesville and in the swamp during the summer and fall of 1912. After the establishment of headquarters at Westford evaporation tanks were installed there, and operated since November and will be continued.

Conclusions and Recommendations.

By the close of 1914 an accurate and detailed estimate of the cost of the project will be ready for presentation to the Legislature, detail plans covering the design of the necessary structures will be completed, and the Commission will be prepared to enter upon the lands and immediately begin measures to acquire the property and to construct the works. It is urged that the Legislature make an appropriation sufficient to complete this project. A careful census of the damage caused by the flood of March, 1913, in the Shenango River Valley, shows that, had this reservoir been built at that time, its entire cost of $1,600,000 would have been saved by the reduction in flood damage which would have been effected by it. This alone, it seems to the Commission, should be enough to convince one of the advantages to accrue from its early construction.

PYMATUNING SWAMP ACT.

An act providing for the erection of a dam at the outlet of Pymatuning Swamp, and the establishment of a reservoir to conserve the waters thereof; providing for the taking of land and materials necessary thereto; vesting certain powers and duties in the Water Supply Commission; and making an appropriation.

Whereas, By an act approved the fourteenth day of June, one thousand nine hundred eleven, entitled "An act providing for a survey of Pymatuning Swamp, and an examination into the feasibility of constructing a reservoir therein to conserve the waters draining into said swamp, and making an appropriation therefor," the Water Supply Commission was directed to survey Pymatuning Swamp, in Crawford County, and the land contiguous or adjacent thereto, and to examine into the feasibility of constructing a dam or dams across the outlet or outlets of said swamp, whereby the waters entering the same might be conserved, and the flow of water regulated in the Shenango and Beaver rivers; and, Whereas, In pursuance of said act, the Water Supply Commission caused said survey to be made, and has presented its report thereon; and,

Whereas, In said report the Water Supply Commission states that the project is a feasible one, that a portion of said Pymatuning Swamp can be converted into a storage reservoir by constructing a dam across the valley of the Shenango river, that the low water flow in the Shenango river would thereby be increased about two hundred seventy-five million gallons per diem, that the reservoir would eliminate any considerable contribution to floods from the territory above the dam, that the proposed reservoir would improve the sanitary conditions of the Shenango and Beaver rivers and of the swamp, that approximately two thousand primary horse power would be added to existing water-power in the Beaver river, that the construction of the dam and reservoir would cause a benefit along the Shenango and Beaver valleys more than commensurate the cost of the project, that the industrial development would be increased, and that the communities in the vicinity of the reservoir would be benefited through improved highways, the creation of an attractive lake, increased water transportation, and better sanitary conditions; therefore,—

Section 1. Be it enacted, &c., That the Water Supply Commission of Pennsylvania is hereby authorized and directed to cause a dam to be constructed across the outlet to Pymatuning Swamp, in Crawford County, for the purpose of establishing a reservoir and of conserving the water entering said swamp, and for the purpose of regulating the flow of water in the Shenango and Beaver rivers. The dam shall be constructed and the reservoir established in accordance with plans and specifications which shall be prepared by, or under the direction of, the commission, and shall be so constructed and established as to conserve said waters in a safe and practical manner, and to regulate the flow therefrom so as to maintain throughout the year as regular a flow of water as possible in said rivers.

Section 2. In carrying out said plans, the commission may acquire, in the name of this Commonwealth, by purchase, condemnation, or otherwise, such lands and materials as may be needed in carrying out the provisions of this act.

Section 3. In acquiring any of said lands or materials, if the commission cannot agree with the owners thereof, or if the owner cannot be found or is not sui juris, the commission may file its petition in the court of common pleas of the county wherein the lands or materials are situated, praying for the appointment of viewers to ascertain the fair value of such land or material. Thereupon the court shall appoint, from among the members of the board of viewers of the county, three viewers, who, by personal inspection and otherwise of the lands or materials proposed to be acquired, shall ascertain and fix the fair value thereof. The court shall fix a time, not less than ten days nor more than twenty days thereafter, for the viewers to meet, either upon said lands or otherwise. Notice of the time and place of meeting of such viewers shall be given, where practicable, by personal service upon the owner, or by such other service as the court may direct. When the viewers shall have completed their labors they shall file their report in writing in the said court. If no exceptions shall be filed thereto within thirty days from the filing of the report, or if no appeal therefrom be filed within said time demanding a trial by jury, the said report shall be confirmed absolutely. After final judgment on any appeal from the award of viewers, an appeal may be had to either the Supreme Court or Superior Court, as the case may require. If, upon any appeal, the award of the viewers is not increased or modified in favor of the appellant, the entire cost of the proceedings subsequent to such award shall be paid by the appellant. In so far as practicable the commission may include in one petition proceedings for the condemnation of all land in one county proposed to be acquired.

In any proceedings under this section the court may appoint such guardians or committees or trustees as the case may require, and may in all cases prescribe the form and manner of service of any notice required in any proceedings under this act.

Section 4. When the entire cost of said lands and materials, including expenses and the cost of said dam and reservoir, shall have been ascertained and fixed as nearly as may be, the commission may take possession of said lands or materials, in the name of this Commonwealth, after giving sixty days' notice thereof by publication in the counties wherein said lands or materials are located. No part of said lands or material shall be taken over by the commission, in the name of the Commonwealth, until by agreement with the owner or by proceedings in condemnation as provided for in this act the entire cost of all said lands and materials shall be ascertained and fixed as nearly as may be.

Section 5. The commission may agree with any person, partnership, association, or corporation for the removal, relocation, elevating, lowering, or otherwise changing, of any railroad, railway, telegraph line, telephone line, electric light, heat or power line, gas line, road, highway, street, or bridge, or any part thereof. If such agreement cannot be made, then such removal, relocation, elevation, lowering, or changing may be done by the commission, and the damages, if any, sustained thereby shall be fixed as in said condemnation proceedings.

Section 6. No land shall be purchased by the commission until the titles thereto have been approved by the Attorney General.

Section 7. When the said dam is completed and said reservoir established, it shall be maintained and operated at the expense of this Commonwealth under the direction of the Water Supply Commission.

Section 8. The sum of four hundred thousand dollars ($400,000), or so much thereof as may be necessary, is hereby specifically appropriated to the Water Supply Commission of Pennsylvania, for the purchase of the said lands, and otherwise for carrying out the purposes of this act. Payment of moneys shall be on order of the chairman of the commission, countersigned by the secretary, and accompanied by itemized and verified vouchers, and upon warrant of the Auditor General. No land shall be acquired under the provisions of this act until there shall be filed with the commission satisfactory waivers of all damages from owners of lands in the State of Ohio, to be submerged, or which may possibly be submerged, through the operation of said dam and reservoir.

Approved—The 25th day of July, A. D. 1913, except as to the item appropriating $400,000 to the Water Supply Commission of Pennsylvania for the purchase of the said lands and otherwise for carrying out the purposes of this act. This item is approved in the sum of $100,000. I withhold my approval from the remainder of said appropriation because of insufficient State revenue.

JOHN K. TENER.

CHAPTER V

HYDROGRAPHIC DIVISION

New Stream Gaging Stations.

The hydrographic work of the Commission has been enlarged and extended during the year, twenty new stream gaging stations having been established as shown by Table No. 14.

TABLE NO. 14.

Stream Gaging Stations Established During 1913.

Stream.	Location.
Chest Creek,	St. Lu.
West Branch, Susquehanna River,	Bower.
West Branch, Susquehanna River,	Clearfield.
Clearfield Creek,	Dimeling.
Moshannon Creek,	Winburne.
Driftwood Branch, Sinnemahoning Creek,	Sterling Run.
Kettle Creek,	Leidy.
West Branch, Susquehanna River,	Lock Haven.
West Branch, Susquehanna River,	Jersey Shore.
West Branch, Susquehanna River,	Lewisburg.
Lycoming Creek,	Trout Run.
Lackawanna River,	Moosic.
Buffalo Creek,	Lewisburg.
Shenango River,	New Castle.
Little Shenango River,	Salem.
Shenango River,	Sharpsville.
Casselman River,	Markleton.
Laurel Hill Creek,	Ursina.
Stony Creek,	Johnstown.
Loyalhanna Creek,	New Alexandria.

The information obtained at several of the new stations is so meager that it is not published. Seven old stations were discontinued, so that the net increase in stations maintained by the Water Supply Commission during the year was thirteen. The stations for which stream flow data appear in this report are shown in Tables Nos. 15, 16, 17, and 18.

TABLE NO. 15.

Gaging Stations in Delaware Basin.*

Station No.	Stream.	Location.
1,	West Branch Delaware river,	Hale Eddy, N. Y. (formerly at Hancock).
2,	East Branch Delaware river,	Fish Eddy, N. Y. (formerly at Hancock).
3,	Wallenpaupack creek,	Wilsonville, Pa.
4,	Shohola creek,	Lords Valley, Pa.
5,	Rattlesnake brook,	Spring Brook, Pa.
6,	Delaware river,	Port Jervis, N. Y.
7,	Big Bushkill creek,	Shoemakers, Pa.
8,	Analomink creek,	Henryville, Pa.
9,	Brodheads creek,	Analomink, Pa.
10,	Pocono creek,	Stroudsburg, Pa.
11,	McMichaels creek,	Stroudsburg, Pa.
12,	Lehigh river,	South Bethlehem, Pa.
13,	Delaware river,	Riegelsville, N. J.
14,	Darby creek,	Lansdowne, Pa.
15,	Brandywine creek,	Chadds Ford, Pa.

*For information available on each station, see "Description of Station."

TABLE NO. 16.

Gaging Stations in Susquehanna Basin.*

Station No.	Stream.	Location.
1,	North Branch Susquehanna river,	Conklin, N. Y.
2,	Chenango river,	Chenango Forks, N. Y.
3,	Chemung river,	Chemung, N. Y.
4,	Wyalusing creek,	Wyalusing, Pa.
5,	Lackawanna river,	Scranton, Pa.
6,	Lackawanna river,	Moosic, Pa.
7,	North Branch Susquehanna river,	Wilkes-Barre, Pa.
8,	North Branch Susquehanna river,	Danville, Pa.
9,	Chest creek,	St. Lu, Pa.
10,	West Branch Susquehanna river,	Bower, Pa.
11,	West Branch Susquehanna river,	Clearfield, Pa.
12,	Clearfield creek,	Dimeling, Pa.
13,	Moshannon creek,	Winburne, Pa.
14,	Driftwood Branch Sinnemahoning creek,	Sterling Run, Pa.
15,	Kettle creek,	Leidy, Pa.
16,	West Branch Susquehanna river,	Renovo, Pa.
17,	Bald Eagle creek,	Milesburg, Pa.
18,	Spring creek,	Bellefonte, Pa.
19,	Bald Eagle creek,	Beech Creek, Pa.
20,	Pine creek,	Waterville, Pa.
21,	Lycoming creek,	Trout Run, Pa.
22,	West Branch Susquehanna river,	Williamsport, Pa.
23,	Loyalsock creek,	Forksville, Pa.
24,	Buffalo creek,	Lewisburg, Pa.
25,	West Branch Susquehanna river,	Lewisburg, Pa.
26,	Raystown Branch Juniata river,	Saxton, Pa.
27,	Frankstown Branch Juniata river,	Huntingdon, Pa.
28,	Kishacoquillas creek,	Kulps, Pa.
29,	Tuscarora creek,	Port Royal, Pa.
30,	Juniata river,	Newport, Pa.
31,	Conodoguinet creek,	Hogestown, Pa.
32,	Susquehanna river,	Harrisburg, Pa.
33,	Yellow Breeches creek,	White Hill, Pa.
34,	Big Swatara creek,	Jonestown, Pa.

*For information available on each station, see "Description of Station."

TABLE NO. 17.

Gaging Stations in Potomac Basin.*

Station No.	Stream.	Location.
1,	Monocacy river,	Frederick, Md.

*For information available on each station, see "Description of Station."

TABLE NO. 18.

Gaging Stations in Ohio Basin.*

Station No.	Stream.	Location.
1,	Allegheny river,	Red House, N. Y.
2,	Kinzua creek,	Dewdrop, Pa.
3,	Conewango creek,	Frewsburg, N. Y.
4,	Brokenstraw creek,	Youngsville, Pa.
5,	Tionesta creek,	Nebraska, Pa.
6,	Oil creek,	Rouseville, Pa.
7,	North Branch French creek,	Kimmeytown, Pa.
8,	Cussewago creek,	Meadville, Pa.
9,	French creek,	Carlton, Pa.
10,	Sugar creek,	Wyattville, Pa.
11,	Clarion river,	Clarion, Pa.
12,	Red Bank creek,	St. Charles, Pa.
13,	Allegheny river,	Kittanning, Pa.
14,	Crooked creek,	Rosston, Pa.
15,	Blacklick creek,	Blacklick, Pa.
16,	Loyalhanna creek,	New Alexandria, Pa.
17,	Kiskiminetas river,	Avonmore, Pa.
18,	West Fork river,	Enterprise, W. Va.
19,	Tygart river,	Fetterman, W. Va.
20,	Cheat river,	Morgantown, W. Va.
21,	Dunkard creek,	"Bobtown," Pa.
22,	Youghiogheny river,	Confluence, Pa.
23,	Casselman river,	Markleton, Pa.
24,	Casselman river,	Confluence, Pa.
25,	Laurel Hill creek,	Ursina, Pa.
26,	Laurel Hill creek,	Confluence, Pa.
27,	Youghiogheny river,	Connellsville, Pa.
28,	Turtle creek,	East Pittsburgh, Pa.
29,	Shenango river,	Turnerville, Pa.
30,	Shenango river,	Sharon, Pa.
31,	Neshannock creek,	New Castle, Pa.
32,	Slippery Rock creek,	Wurtemburg, Pa.

*For information available on each station see "Description of Station."

Checking Gages.

In order to maintain the accuracy of the records each gaging station was inspected one or more times during the year, when, in addition to taking current meter discharge measurements, the gages were checked with bench marks, and the proper adjustments made, so that the gage heights as recorded are at all times on the same datum. The wide variations in temperature occurring between summer and winter, causes steel bridges to expand and contract and consequently the elevation of the gages on them are affected, and observations are being made to determine the amount and direction of these changes.

Automatic Gages.

At most stations two gage readings are taken daily, for the purpose of getting nearer the true mean daily stage. When the stage fluctuates rapidly this is not a sufficient number of observations to give a reliable mean, and consequently, during floods, readings are taken more frequently. In order to eliminate error due to insufficient observations and also to the personal equation of observers, there is a growing demand for accurate and trustworthy automatic recording gages. The Commission has tried some, and has watched experiments with others, but has not as yet found a gage of sufficient reliability to warrant the expense of replacing observers with automatic recording instruments. Experiments now being carried on with a pressure gage seem to indicate that this style of instrument may prove adaptable to the conditions under which gages on Pennsylvania streams must operate, and it is to be hoped that before long the error due to inaccuracies of observers may be eliminated by the general use of some form of automatic recording gage.

Value of Long Term Records.

The yield of a stream changes from year to year with variations in precipitation, and it is obvious that observations extending continuously over many years are required in order to produce a record which can be taken as a reliable index of the characteristics of a stream. There are a few such long-term records on Pennsylvania rivers, and fortunately a number of the Commission's stations were operating during the extraordinarily dry period of 1908, 1909 and 1910, so that the results then obtained represent as low figures as may reasonably be anticipated.

Discharge Curve Changes.

The discharge curves for numerous stations have been found to change from year to year, caused by cutting or filling of the channel at the gaging station, the former producing an increased flow, and the latter a decreased flow for the same stage. In order to obtain accurate cross sections, soundings, by means of a wire and weight, are taken twice a year at each station. As meter measurements are taken from time to time, these changes in the discharge for the same stage are detected and new curves drawn, or the old ones revised to conform to the new conditions. During periods of unusually high water measurements of discharge are frequently obtained at stages higher than those previously measured, and such determinations, when plotted on the discharge curve, occasionally necessitate material alterations of the curve, and a consequent change in the data previously compiled. During the month of March, 1913, 39 high

Gaging Station on Loyalhanna Creek, at New Alexandria.

Gaging Station on Stony Creek, at Johnstown.

water discharge measurements were made, some of which, taken at unusual flood stages, completely changed discharge curves, requiring revision of former computations.

Extension of the Stream Gaging System.

In the past, Pennsylvania gagings have been practically confined to the larger streams, but due to the increase in their use, the water resources are becoming constantly more valuable. The smaller streams have now attained an importance which they did not possess some years ago, and their development should be in line with the best utilization. Many of the requests for stream flow data that come to the Commission relate to the smaller water courses. For these reasons, and on account of the many uses to which these data are put, the Commission proposes to extend its gaging system from time to time as its appropriation will permit, so as to gradually include many of the smaller streams. It is believed that Pennsylvania operates through this Commission the most extensive State system of stream gaging in the United States, comprising, as it does, 70 stations, besides 12 operated by others, on streams which flow into or out of the State.

Application of Stream Discharge Data.

A knowledge of stream discharge is essential to the proper design of hydraulic projects, and the lack of such information not only retards the utilization of latent possibilities of the streams but often becomes the cause of the failure of water supply, water power and other companies depending on surface water supplies. It is necessary to know the minimum (and its duration), maximum and average discharge of a stream to design works which will successfully and economically apply the water to the purpose desired.

Among the foremost uses to which discharge data are applicable is stream flow regulation by storage. The extensive system of dams and reservoirs proposed by the Flood Commission of Pittsburgh, for reducing floods in the Allegheny, Monongahela, and upper Ohio rivers, was determined upon the basis of the stream flow data collected by the Water Supply Commission of Pennsylvania on these rivers and their tributaries. A dependable report on the Pymatuning Swamp Reservoir project, which involves the regulation of the flow of the Shenango River, a stream having a drainage area of 1,047 square miles, and flowing through several large industrial centers in the western part of the State, was made possible only through the availability of stream flow records. Several years previous to the passage of the bill providing for the Pymatuning Reservoir survey, the collection of the stream flow data on the Shenango River and its tributaries was started, and the data thus obtained have afforded a satisfactory record for the hydrographic studies involved in that project.

In designing a water power plant on an unregulated river, namely, one whose flow varies widely, the minimum flow and duration of the period of low water are the limiting factors. Many errors have been made in determining these factors where long term discharge records were not available, and the failure of the company sometimes followed. Where such knowledge exists, works may be designed and built with confidence, and the results are far more likely to be favorable. To attempt to construct a hydro electric plant without these data is hazardous, and the fact that it has often been attempted with disastrous results has been partly responsible for the reputation for financial insecurity which some of these projects have.

For the work ot the Commission, in acting on applications of water companies for dams and obstructions, or for the incorporation of water supply and water power companies, the data collected by the Hydrographic Division is used to make the computations necessary to show the correctness of the design of the structure under consideration, and to determine upon the feasibility and probable success of the enterprise. For bridges, the records of maximum run-off are used to determine the adequacy or inadequacy of free channel area under them for the proper discharge of floods; for fills and other obstructions, they show whether or not there is sufficient channel area to take care of maximum discharges without damaging other property; while in the design of spillways for dams the stream flow records are of vital importance.

Determinations of Coefficients of Roughness.

During the summer of 1913 a new class of hydraulic work was inaugurated, viz, the collection of data necessary for the computation of the coefficient of roughness, "n" in Kutter's formula (see note). The values of "n" are determined at the bridge section at each gaging station, and should prove a valuable addition to the information available for the computation of flood discharge in the design of new bridges, in the alteration of old ones, and in various other hydraulic designs. The field work includes a careful cross section of the stream at the bridge, the water surface slope above and below the structure, together with a simultaneous measurement of discharge of the stream.

In determining the mean velocity at a section whose discharge is unknown it is necessary to use, in addition to the slope and hydraulic mean radius, the value of the coefficient of roughness, which depends upon the materials forming the bed and banks of the channel and

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NOTE:—Kutter's formula is generally accepted as one of the most reliable. In it "n" is a variable factor indicative of the relative roughness of channel or waterway.

irregularities therein, together with other conditions that tend to produce a retardation of flow, such as piers, curves, eddies, aquatic plants, etc. Experimental data on this subject are limited and the values of "n" commonly accepted must be considered approximations only, until verified by actual observations and computations. It is the purpose of the Commission to continue these experiments at all gaging stations at various stages, including low water and floods. In the meantime it is proposed to verify, by repeated experiments, the data thus far collected, before publishing the results of this work.

Rainfall Stations.

Studies of rainfall have been made, and, in addition to records of precipitation available from United States Weather Bureau stations, the Water Supply Commission receives data from its own rainfall stations. During 1913 the following precipitation stations were established: Union City, Erie County; Pleasant Mount, Wayne County; Cresson and Falls Creek, Clearfield County; Glenhazel, Elk County; Cloe, Jefferson County; Creekside, Indiana County; Eaglesmere, Sullivan County; Hadley, Westford, Turnersville and Linesville, Crawford County.

Flood Warning.

On April 7, 1913, a bill was introduced into the House of Representatives, as a result of the flood of March, 1913, directing the Water Supply Commission of Pennsylvania to establish and maintain gaging stations on certain streams within the State and to issue flood warnings. This bill, which carried an appropriation of $10,000, was passed by the Legislature, and signed by the Governor on May 23, 1913, and provides that freshet and flood conditions be telegraphed and telephoned to municipalities when and where flood damage may be expected, forecasting, as near as may be, the probable maximum gage heights which will be reached, and the probable time of the arrival of such maximum stage.

The streams in the Allegheny and Monongahela watersheds have been gaged more completely than those of the Susquehanna, and much information is therefore available for the prediction of flood crests on these rivers. The Delaware River is subject to the influence of New York and New Jersey tributaries, so that the forecasting of floods on that stream will have to be taken up with those states. Because of these facts, the work under this act has been undertaken first on the Susquehanna watershed, although it is intended to gradually extend the system throughout the State. Since the demand for this system originated along the West Branch of the Susquehanna River, it was decided to undertake the first steps under the act in that basin.

The West Branch of the Susquehanna River, which joins the North Branch at Northumberland, drains a total area of approximately 7,000 square miles, lying entirely within the State. It has a total length of 226 miles with numerous large tributaries, several of which drain over 900 square miles, all joining the river above Williamsport, which is 41 miles above the mouth. After the passage of the Flood Warning Act, a map of the streams in the West Branch drainage area was drawn and 18 points were selected to investigate for new gaging stations, in addition to the eight already maintained. In the meantime studies were made of the past floods, in an effort to establish certain definite relations between up and down river gage heights. During the summer of 1913 a reconnoissance was made of the streams previously selected, and, as a result, eleven stations were installed. Seven of these are discharge measurement stations, viz, Chest Creek at St. Lu, Susquehanna River at Bower, Clearfield Creek at Dimeling, Moshannon Creek at Winburne, Driftwood Branch of Sinnemahoning Creek at Sterling Run, Kettle Creek at Leidy, and Buffalo Creek near Lewisburg; while four are gage height stations only, viz, the Susquehanna River at Clearfield, Lock Haven, Jersey Shore, and Lewisburg.

The office studies of past floods have been continued, and have shown that flood stages for some localities may be predicted on the basis of gage height relations, while those at other places must be forecasted from a knowledge of gage heights at Wilkes-Barre on the North Branch of the Susquehanna River, Williamsport on the West Branch, and Newport on the Juniata River. A proportional increment from each of the latter three stations added to the stage at Harrisburg before the rise, together with modifications due to condition of soil and precipitation, will show the gage height that may be expected at Harrisburg.

At Williamsport, on the other hand, where much flood damage often occurs, it has been found that during a general rain the flood crests at Williamsport, Renovo, and Clearfield usually occur simultaneously, although the first inference would be, without investigation, that the crest should be cumulative, while progressing from Clearfield to Renovo and Williamsport. This is due to the fact that the tributary drainage area of the West Branch of the Susquehanna River is divided into three main drainage basins, discharging their floods simultaneously at Clearfield, Renovo, and Williamsport, the resulting effect upon the lower points being to sustain the flood stage for a longer period and not to simultaneously add to its magnitude. It is, therefore, necessary to predict flood stages at Williamsport from a knowledge of the quantity of water discharged from all the main tributaries above Williamsport, and eventually it is believed the discharge method will be generally adopted.

After the basin of the West Branch has been provided with the necessary gaging stations a reconnoissance of the North Branch and its principal tributaries was made. The stations now maintained in the basin of the North Branch are located on the Susquehanna River at Danville and Wilkes-Barre, on the Lackawanna River at Moosic, and on Wyalusing Creek at Wyalusing. The United States Geological Survey operates gaging stations on the North Branch of the Susquehanna River at Binghamton and Conklin, N. Y., on the Chenango River at Chenango Forks, N. Y., and on the Chemung River at Chemung, N. Y. As a result of the investigation made along these streams, it has been decided to place additional stations on the North Branch of the Susquehanna River at Towanda, on Towanda Creek above Monroeton, on Mehoopany Creek at Mehoopany, on Tunkhannock Creek at Dixon, on Bowman Creek at Eatonville, and on Fishing Creek at Bloomsburg. These additional stations will be installed during the early part of next year.

Value of Flood Warnings.

The Flood Warning Act has been in operation but six months, and specific instances may be cited at this early time where the Flood Warning Service has saved to the people of the State the full value of the appropriation. These warnings accomplish two results, namely, they warn people in due season, so that provision for oncoming high water may be made, and they prevent unnecessary and costly precautions in anticipation of flood stages which do not materialize. Below is the text of the Flood Warning Act, which contains direct authorization of the Commission to establish stream gaging stations, showing the appreciation of the Legislature of the value of this work. Heretofore the Commission has established and operated its stations by virtue of its general authority to "acquaint itself with the conditions of the Water Supply of the Commonwealth."

FLOOD WARNING ACT.

An act authorizing the Water Supply Commission of Pennsylvania to establish and maintain gauging stations on certain streams within the Commonwealth of Pennsylvania; authorizing said commission to issue flood wornings, and making an appropriation therefor.

Whereas, The recent flood conditions have demonstrated the importance and necessity of establishing and maintaining gauging stations on the streams within the Commonwealth of Pennsylvania, in order that freshet and flood conditions may be telegraphed and telephoned to certain municipalities, where flood damage is likely to be caused, forecasting as near as may be the probable maximum gauging heights expected to be reached, and the probable time of the arrival of such gauge heights; therefore,—

Section 1. Be it enacted, &c., That the Water Supply Commission of Pennsylvania is hereby authorized to establish and to maintain such gauging stations on the principal rivers and tributaries thereof as- in the judgment of the commission, may be necessary for the determination of the daily height of water in such streams and tributaries thereof, as well as the amount of water flowing therein.

Section 2. The Commission shall, during freshet and flood conditions, issue bulletins, to be telegraphed or telephoned to such municipalities in the Commonwealth where flood damage is likely to be caused, forecasting the probable maximum gauge heights expected to be reached, and the probable time of the arrival of such gauge heights.

Section 3. The sum of ten thousand dollars, or so much thereof as may be necessary, is hereby specifically appropriated to the Water Supply Commission of Pennsylvania, for the purpose of carrying into effect the provisions of this act.

Approved—The 23d day of May, A. D. 1913.

JOHN K. TENER.

APPENDIX A.

HYDROGRAPHIC DATA

FOR

1913

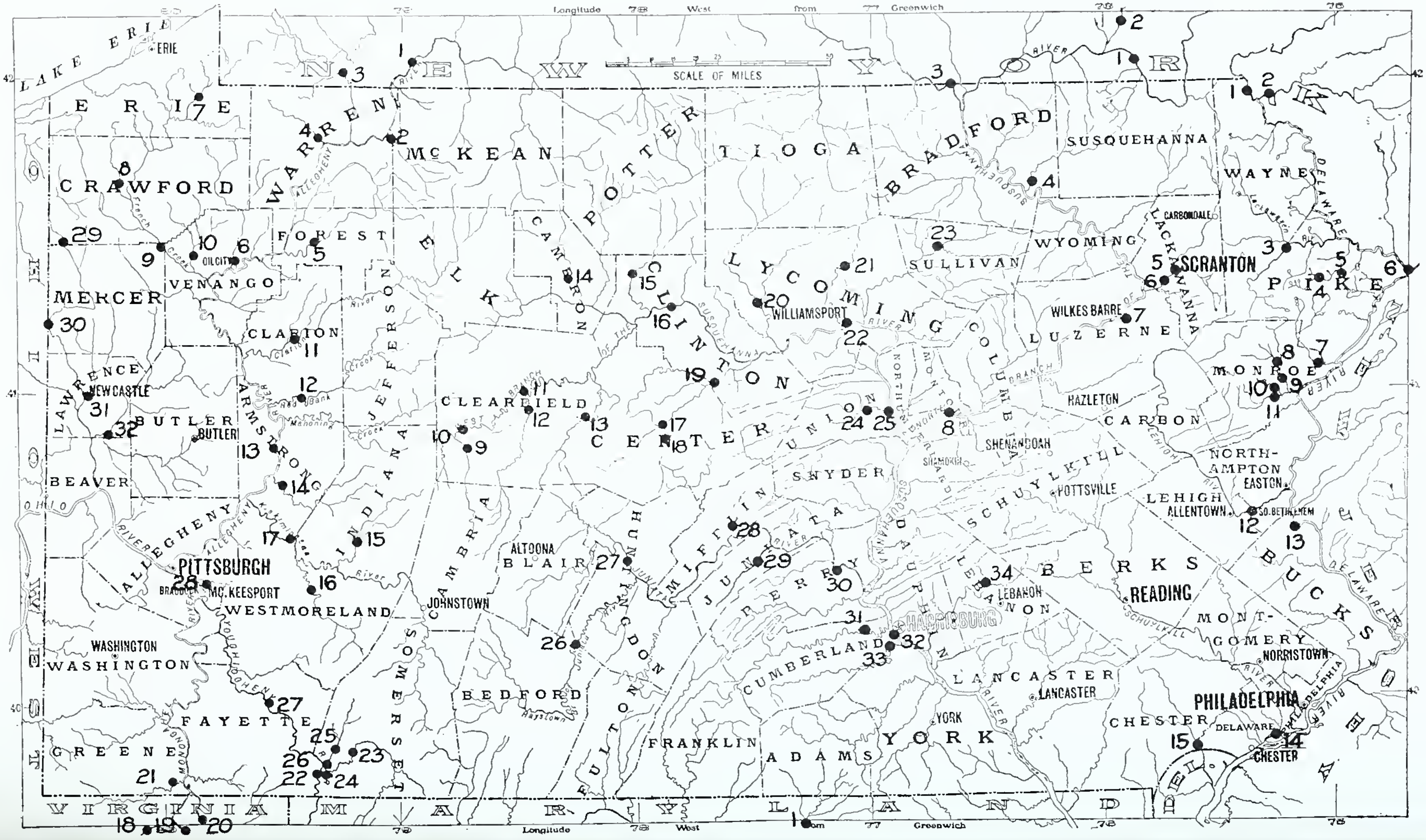
WATER SUPPLY COMMISSION OF PENNSYLVANIA

MAP SHOWING LOCATION

—OF—

GAGING STATIONS

1913



DELAWARE BASIN

WEST BRANCH DELAWARE RIVER.

DESCRIPTION OF BASIN.

This stream has its source in a small lake almost on the line of Schoharie and Delaware counties, New York, at an elevation of approximately 1,900 feet above sea level, on the western slope of the Catskill mountains and drains a total of 660 square miles. It flows southwesterly through a hilly, plateau region, well populated in the main valley, and the hills well timbered, to Deposit, about 5 miles above the State Line, where it turns southeast and in about 5 miles joins the East Branch at Hancock, New York. About 8 miles above Deposit at Cannonsville is the site of a large storage reservoir proposed by the State Water Supply Commission of New York to flood a long, broad valley, and contain approximately 7,000,000,000 cubic feet available storage.

At Hancock, the elevation is 895 feet above sea level, and the rise from there to Cannonsville, 16 miles above, is at the rate of 7 feet per mile, while above this point the slope is steeper. In the upper section there are numerous lakes, ponds and swampy areas, the basin being relatively long and narrow with numerous short, lateral tributaries. The largest tributary is Oquaga creek, which comes in at Deposit from the west. The mean annual precipitation over this watershed is approximately 40 inches.

The discharge of this stream has been measured from October, 1902, to December, 1912, at Hancock, N. Y., near its mouth, and from November, 1912, at Hale Eddy, N. Y.

DELAWARE BASIN—STATION NO. 1.

WEST BRANCH DELAWARE RIVER AT HALE EDDY, N. Y.

DESCRIPTION OF STATION.

LOCATION—On highway bridge 400 feet west of the Erie Railroad station in the village of Hale Eddy, 8¼ miles above junction with East Branch at Hancock, 8 miles below the power dam of the Deposit Electric Co.

RECORDS AVAILABLE—Discharge complete from November 15, 1912, to December 31, 1913.

DRAINAGE AREA—594 square miles.

GAGE—A vertical staff gage in four sections, read by William Seely.

DISCHARGE MEASUREMENTS—Made by wading across three channels above the bridge, or one below, in low water. High water measurements made from highway bridge.

CHANNEL—The bed of the stream consists of coarse gravel and boulders. The control is about ¾ mile below the gage and is apparently permanent. Between the control and the gage there is low land behind the left bank which is overflowed by extreme high water. The gage heights during the winter are seriously affected by ice.

REMARKS—The data on this station have been furnished by the United States Geological Survey.

DISCHARGE MEASUREMENTS OF WEST BRANCH DELAWARE RIVER, AT HALE EDDY, N. Y.

(Drainage Area 594 square miles.)

No	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1912							
1	Nov. 21	Weber,	271	239	2.70	2.99	646	0.2 & 0.8 method.
	1913							
2	March 11	Weber,	186	789	2.59	4.90	2,040	0.2 & 0.8 method.
3	March 12	Weber,	172	768	2.41	4.79	1,850	0.2 & 0.8 method.
4	March 27	Weber,	222	2,980	7.66	14.75	22,800	0.2 & 0.8 method.
5	March 31	Weber,	220	1,110	2.82	6.22	3,130	0.2 & 0.8 method.
6	May 8	De Golyer,	198	419	0.65	2.28	272	Msmt. by wading 500′ below gage. 0.2 & 0.8 method.
7	July 30	Canfield,	105	144	0.39	1.32	56	Msmt. by wading 500′ below gage. 0.2 & 0.8 metbod.

DISCHARGE TABLE FOR WEST BRANCH DELAWARE RIVER, AT HALE EDDY, N. Y. FOR 1912 AND 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.00	15	.80	1140	.60	3560	.40	7350	.20	14040
.10	24	.90	1210	.70	3670	.50	7530	.30	14340
.20	36	4.00	1280	.80	3780	.60	7710	.40	14650
.30	50	.10	1355	.90	3890	.70	7890	.50	14960
.40	66	.20	1430	7.00	4000	.80	8080	.60	15280
.50	84	.30	1505	.10	4120	.90	8270	.70	15600
.60	104	.40	1580	.20	4240	10.00	8470	.80	15930
.70	126	.50	1660	.30	4360	.10	8670	.90	16260
.80	150	.60	1740	.40	4480	.20	8880	13.00	16600
.90	176	.70	1820	.50	4600	.30	9090	.10	16950
2.00	204	.80	1900	.60	4720	.40	9310	.20	17300
.10	234	.90	1985	.70	4840	.50	9530	.30	17650
.20	268	5.00	2070	.80	4960	.60	9760	.40	18000
.30	304	.10	2155	.90	5090	.70	9990	.50	18350
.40	342	.20	2240	8.00	5220	.80	10230	.60	18700
.50	382	.30	2325	.10	5350	.90	10470	.70	19050
.60	424	.40	2410	.20	5480	11.00	10720	.80	19400
.70	470	.50	2500	.30	5620	.10	10970	.90	19750
.80	520	.60	2590	.40	5760	.20	11230	14.00	20100
.90	575	.70	2680	.50	5900	.30	11490	.10	20460
3.00	630	.80	2770	.60	6050	.40	11760	.20	20820
.10	685	.90	2860	.70	6200	.50	12030	.30	21180
.20	745	6.00	2950	.80	6350	.60	12310	.40	21540
.30	805	.10	3050	.90	6510	.70	12590	.50	21900
.40	870	.20	3150	9.00	6670	.80	12870	15.00	23700
.50	935	.30	3250	.10	6840	.90	13160	.50	25500
.60	1000	.40	3350	.20	7010	12.00	13450	16.00	27300
.70	1070	.50	3450	.30	7180	.10	13740		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF WEST BRANCH DELAWARE RIVER, AT HALE EDDY, N. Y.

1912. DAY.	NOVEMBER.		DECEMBER.	
	Gage height.	Discharge.	Gage height.	Discharge.
1,	....	....	2.7	470
2,	....	....	3.1	685
3,	....	....	6.6	3560
4,	....	....	5.6	2590
5,	....	....	5.4	2410
6,	....	....	5.6	2590
7,	....	....	5.4	2410
8,	....	....	4.8	1900
9,	....	....	4.4	1580
10,	....	....	4.0	1280
11,	....	....	3.9	1210
12,	....	....	3.6	1000
13,	....	....	3.1	685
14,	....	....	3.15	715
15,	3.5	935	3.3	805
16,	3.25	775	3.3	805
17,	3.25	775	3.05	658
18,	3.2	745	3.05	658
19,	3.05	658	3.6	1000
20,	3.0	630	4.7	1820
21,	2.85	548	4.0	1280
22,	2.65	447	3.8	1140
23,	2.65	447	3.7	1070
24,	2.65	447	3.4	870
25,	3.0	630	3.45	902
26,	3.05	658	3.15	715
27,	3.05	658	3.45	902
28,	2.9	575	3.05	658
29,	2.85	548	2.95	602
30,	2.65	447	3.25	775
31,	....	....	5.10	2160

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF WEST BRANCH DELAWARE RIVER, AT HALE EDDY, N. Y.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	4.5	1660	4.5	1660	5.6	2590	6.4	3350	2.75	495	3.8	1140	1.7	126	1.3	50	1.2	36	1.45	75	2.15	251	3.3	805
2,	4.1	1360	3.6	1000	4.9	1980	5.2	2240	2.45	362	3.6	1000	1.68	122	1.3	50	1.25	43	1.5	84	2.20	268	3.15	715
3,	5.5	2500	3.3	805	4.0	1280	5.1	2160	2.5	382	3.4	870	1.5	84	1.3	50	1.2	36	1.5	84	2.05	219	3.1	685
4,	7.3	4360	3.15	715	4.1	1360	4.7	1820	2.35	323	4.0	1280	1.5	84	1.4	66	1.25	43	1.5	84	2.00	204	3.05	658
5,	5.8	2770	3.05	658	4.2	1430	5.2	2240	2.25	286	3.3	805	1.45	75	1.4	66	1.2	36	1.5	84	2.00	204	3.1	685
6,	5.4	2410	2.65	447	4.2	1430	4.8	1900	2.3	304	3.1	685	1.45	75	1.35	58	1.2	36	1.5	84	1.95	190	2.95	602
7,	6.6	3560	2.6	424	3.1	685	4.7	1820	2.15	251	2.9	575	1.5	84	1.3	50	1.25	43	1.48	80	1.98	198	3.15	715
8,	10.6	9760	2.65	447	2.8	520	4.4	1580	2.1	234	2.75	495	1.5	84	1.3	50	1.15	30	1.48	80	1.95	190	4.3	1500
9,	8.6	6050	2.95	602	3.4	870	4.2	1430	2.2	268	2.6	424	1.48	80	1.3	50	1.15	30	1.40	66	4.6	1740	4.2	1430
10,	6.6	3560	2.75	495	4.2	1430	4.0	1280	2.3	304	2.6	424	1.48	80	1.4	66	1.15	30	1.42	70	7.6	4720	3.5	935
11,	6.4	3350	3.35	838	4.8	1900	4.4	1580	2.05	219	2.45	362	1.48	80	1.35	58	1.25	43	1.38	63	5.6	2590	3.60	1000
12,	7.5	4600	2.7	470	4.4	1580	5.2	2240	2.45	362	2.3	304	1.42	70	1.3	50	1.15	30	1.30	50	4.8	1900	3.45	902
13,	6.2	3150	*	......	4.7	1820	4.7	1820	2.1	234	2.3	304	1.4	66	1.2	36	1.15	30	1.40	66	4.6	1740	3.4	870
14,	5.4	2410	....	......	5.6	2590	4.6	1740	2.05	219	2.15	251	1.5	84	1.2	36	1.15	30	1.40	66	4.6	1740	3.5	935
15,	5.2	2240	....	......	6.7	3670	4.5	1660	1.98	198	1.98	198	1.5	84	1.18	34	1.15	30	1.45	75	4.4	1580	3.5	935
16,	4.8	1900	....	......	6.6	3560	4.2	1430	2.05	219	2.15	251	1.5	84	1.15	30	1.1	24	1.45	75	4.0	1280	3.4	870
17,	5.8	2770	....	......	5.5	2500	3.9	1210	2.05	219	1.9	176	1.45	75	1.2	36	1.1	24	1.40	66	3.9	1210	3.25	775
18,	6.6	3560	....	......	4.8	1900	3.8	1140	1.95	190	2.4	342	1.5	84	1.15	30	1.1	24	1.35	58	3.9	1210	3.2	745
19,	6.7	3670	....	......	4.6	1740	3.6	1000	2.0	204	1.85	163	1.5	84	1.22	39	1.15	30	1.40	66	3.8	1140	3.1	685
20,	5.6	2590	....	......	4.9	1980	3.45	902	1.95	190	1.9	176	1.4	66	1.3	50	1.2	36	2.5	382	4.0	1280	2.6	424
21,	6.4	3350	....	......	5.2	2240	3.4	870	1.95	190	2.05	219	1.4	66	1.2	36	1.1	24	4.0	1280	4.2	1430	2.85	548
22,	5.6	2590	....	......	5.4	2410	3.15	715	1.95	190	2.0	204	1.35	58	1.2	36	2.1	234	3.8	1140	3.9	1210	2.75	495
23,	5.2	2240	....	......	4.7	1820	4.1	1360	2.15	251	1.9	176	1.3	50	1.25	43	2.05	219	2.7	470	3.8	1140	2.75	495
24,	5.6	2590	....	......	5.2	2240	3.5	935	3.2	745	1.9	176	1.35	58	1.2	36	2.0	204	2.5	382	3.7	1070	3.25	838
25,	5.2	2240	....	......	5.7	2680	2.75	495	3.3	805	1.8	150	1.25	43	1.2	36	1.88	171	2.65	447	3.6	1000	3.25	775
26,	4.7	1820	....	......	7.9	5090	2.75	495	2.95	602	1.75	138	1.3	50	1.15	30	1.65	115	2.6	424	3.6	1000	3.25	775
27,	4.6	1740	....	......	13.6	18700	2.5	382	2.85	578	1.75	138	1.3	50	1.15	30	1.6	104	2.8	520	3.5	935	2.75	495
28,	4.5	1660	....	......	11.9	13200	2.15	251	3.05	658	1.7	126	1.3	50	1.2	36	1.5	84	2.7	470	3.45	902	2.4	342
29.	3.9	1210	....	......	8.6	6050	2.55	403	5.4	2410	1.6	104	1.38	63	1.2	36	1.4	66	2.55	403	3.15	715	2.5	382
30,	3.8	1140	....	......	7.0	4000	3.0	630	4.6	1740	1.7	126	1.4	66	1.2	36	1.4	66	2.4	342	3.60	1000	2.6	424
31,	3.8	1140	....	......	6.2	3150	....	......	4.2	1430	....	......	1.35	58	1.2	36	....	......	2.3	304	......	......	2.8	520

*Gage observations suspended February 13 to 28, inclusive, on account of ice.

ESTIMATED MONTHLY DISCHARGE OF WEST BRANCH DELAWARE RIVER, AT HALE EDDY, N. Y.

(Drainage area 594 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1912.					
November 15th to 30th, inclusive, ...	935	3560	620	1.04	.62
December, ...	447	470	1290	2.17	2.50
1913.					
January, ...	9760	1140	2900	4.88	5.63
February, ...	....	....	615	1.04	1.08
March, ...	18700	520	3170	5.34	6.16
April, ...	3350	251	1370	2.31	2.58
May, ...	2410	190	486	.820	.95
June, ...	1280	104	393	.663	.74
July, ...	126	43	736	.124	.14
August, ...	66	30	434	.073	.08
September, ...	234	24	650	.109	.12
October, ...	1280	50	242	.407	.47
November, ...	4720	190	1140	1.92	2.14
December, ...	1500	342	741	1.25	1.44
The year, ...	18700	24	943	1.59	21.53

EAST BRANCH DELAWARE RIVER.

DESCRIPTION OF BASIN.

This stream rises at Grand Gorge in northeast Delaware County, New York, on the western slope of the Catskill mountains, at an elevation of 1,560 feet above sea level, and flows southwest through a hilly, plateau region, well populated in the main valley and in those of some of the largest tributaries, to its junction with the West Branch at Hancock, New York. The headwaters of its tributaries are in a wild, uninhabited region, well timbered, the highest hills reaching to 4,000 feet above sea level. Its largest tributary is Beaver Kill, coming in about 20 miles above Hancock on which stream are many lakes and ponds. The drainage area is broader and tributaries longer than those of the West Branch.

The total drainage area of the East Branch is 840 square miles, over which the mean annual precipitation is approximately 40 inches.

From its mouth to Margaretville, a distance of about 55 miles, the slope is 430 feet, giving an average slope of 8 feet per mile.

The discharge has been measured at Hancock, New York, from October, 1902, to December, 1912, and at Fish Eddy, New York, from November, 1912.

DELAWARE BASIN—STATION NO. 2.

EAST BRANCH DELAWARE RIVER AT FISH EDDY, N. Y.

DESCRIPTION OF STATION.

LOCATION—On the highway bridge near the N. Y., Ontario, and Western Ry. Station at Fish Eddy, 5½ miles above the confluence of the East and West Branches of the Delaware river, at Hancock, N. Y.

RECORDS AVAILABLE—Discharge complete from November 19, 1912, to December 31, 1913.

DRAINAGE AREA—790 square miles.

GAGE—A vertical staff in two sections, read by John Fininegan.

DISCHARGE MEASUREMENTS—At low stages by wading, at high stages from the highway bridge.

CHANNEL—The bed is composed of coarse gravel, apparently permanent. The winter flow is somewhat affected by ice.

REMARKS—The data on this station have been furnished by the United States Geological Survey.

DISCHARGE MEASUREMENTS OF EAST BRANCH DELAWARE RIVER, AT FISH EDDY, N. Y.

(Drainage area 790 square miles.)

No.	Date.	Hydrographer.	Width.	Area of sectoin.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1912		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
1	Nov. 20	Weber,	178	415	2.53	3.59	1050	.2 & .8 metbod=From gage on bigbway bridge 200 feet above regular gage.
	1913							
2	March 10	Weber,	95	292	5.76	4.46	1680	.2 & .8 metbod.
3	March 12	Weber,	160	512	3.46	4.30	1770	.2 & .8 method.
4	March 13	Weber,	169	511	3.19	4.21	1630	.2 & .8 method.
5	March 19	Weber,	379	1120	2.34	5.31	2620	.2 & .8 method=From gage on bigbway bridge 200 feet above regular gage.
6	March 27	Weber,	384	4100	4.95	12.73	19400	.2 & .8 metbod=From gage on bigbway bridge 200 feet above regular gage.
7	March 31	Weber,	377	1820	3.26	7.27	5930	.2 & .8 metbod=From gage on bighway bridge 200 feet above regular gage.
8	May 9	De Golyer,	179	252	3.23	3.34	816	.2 & .8 metbod=Msmt. made by wading about 250 feet above gage.
9	July 31	Canfield,	93	125	1.02	1.78	127	.2 & .8 metbod=Msmt. made by wading about 200 feet below gage.
10	Sept. 16	Barnes,	79	107	0.74	1.57	786	.2 & .8 metbod=Msmt. made by wading about 200 feet below gage.
11	Sept. 16	Barnes,	79	103	0.71	1.53	730	.2 & .8 method=Msmt. made hy wading about 200 feet below gage.
12	Oct. 28	Barnes,	170	376	4.85	4.37	1820	.2 & .8 method.

DISCHARGE TABLE OF EAST BRANCH DELAWARE RIVER, AT FISH EDDY, N. Y., FOR GAGES AT RAILROAD BRIDGE FOR 1912 AND 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.50	67	.50	370	.50	950	.50	1960	.50	3340
.60	88	.60	412	.60	1040	.60	2080	.60	3500
.70	110	.70	456	.70	1130	.70	2200	.70	3660
.80	134	.80	504	.80	1220	.80	2330	.80	3820
.90	161	.90	556	.90	1320	.90	2470	.90	3990
2.00	190	3.00	610	4.00	1420	5.00	2600	6.00	4160
10	222	.10	670	.10	1520	.10	2740		
.20	256	.20	730	.20	1630	.20	2890		
.30	292	.30	800	.30	1740	.30	3040		
.40	330	.40	870	.40	1850	.40	3190		

DISCHARGE TABLE OF EAST BRANCH DELAWARE RIVER, AT FISH EDDY, N. Y., FOR GAGE AT HIGHWAY BRIDGE, FROM NOV., 1912 TO APRIL 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
6.00	3650	.50	6390	9.00	9730	.50	13500	12.00	17450
.10	3810	.60	6600	.10	9970	.60	13760	.10	17720
.20	3970	.70	6810	.20	10210	.70	14020	.20	17990
.30	4130	.80	7020	.30	10450	.80	14280	.30	18260
.40	4300	.90	7230	.40	10700	.90	14540	.40	18530
.50	4470	8.00	7450	.50	10950	11.00	14800	.50	18800
.60	4650	.10	7670	.60	11200	.10	15060	.60	19080
.70	4830	.20	7890	.70	11450	.20	15320	.70	19360
.80	5010	.30	8110	.80	11700	.30	15580	.80	19640
.90	5200	.40	8330	.90	11950	.40	15840	.90	19920
7.00	5390	.50	8560	10.00	12200	.50	16100	13.00	20200
.10	5580	.60	8790	.10	12460	.60	16370	14.00	23000
.20	5780	.70	9020	.20	12720	.70	16640		
.30	5980	.80	9250	.30	12980	.80	16910		
.40	6180	.90	9490	.40	13240	.90	17180		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF EAST BRANCH DELAWARE RIVER AT FISH EDDY, N. Y.

1912. DAY.	NOVEMBER.		DECEMBER.	
	Gage height.	Discharge.	Gage height.	Discharge.
1,	....	....	3.3	800
2,	....	....	3.4	870
3,	....	....	8.0	7450
4,	....	....	6.5	4470
5,	....	....	5.7	3660
6,	....	....	6.7	4830
7,	....	....	6.6	4650
8,	....	....	5.8	3820
9,	....	....	5.3	3040
10,	....	....	5.0	2600
11,	....	....	4.8	2330
12,	....	....	3.8	1220
13,	....	....	3.7	1130
14,	....	....	3.5	950
15,	....	....	4.0	1420
16,	....	....	3.9	1320
17,	....	....	3.8	1220
18,	....	....	3.3	800
19,	3.6	1040	5.2	2890
20,	3.6	1040	5.3	3040
21,	3.5	950	4.9	2470
22,	3.4	870	4.5	1960
23,	3.3	800	4.3	1740
24,	3.35	835	4.3	1740
25,	4.1	1520	4.2	1630
26,	3.8	1220	4.0	1420
27,	3.7	1130	3.8	1220
28,	3.6	1040	3.8	1220
29,	3.45	910	3.9	1320
30,	3.4	870	3.7	1130
31,	....	....	6.1	3810

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF EAST BRANCH DELAWARE RIVER AT FISH EDDY, N. Y.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	5.1	2740	5.1	2740	....	†3500	6.8	5010	4.4	1850	4.6	2080	....	......	2.2	256	1.92	167	2.4	330	3.5	950	4.4	1850
2,	4.7	2200	....	......	....	†3000	5.8	3820	4.3	1740	4.4	1850	....	......	2.1	222	1.84	145	2.85	530	3.45	910	4.4	1850
3,	6.0	4160	....	......	....	†2600	5.6	3500	4.1	1520	4.0	1420	....	......	2.0	190	1.79	132	2.85	530	3.45	910	4.5	1960
4,	8.8	9250	....	......	4.6	2080	5.3	2040	3.8	1220	6.4	4300	....	......	1.86	150	1.74	120	2.55	391	3.4	870	4.4	1850
5,	7.0	5390	....	......	4.4	1850	5.9	3990	3.8	1220	5.2	2890	....	......	1.82	139	1.71	112	2.5	370	3.4	870	4.3	1740
6,	6.3	4130	....	......	4.2	1630	5.4	3190	3.7	1130	4.6	2080	....	......	1.78	129	1.77	127	2.4	330	3.35	835	4.3	1740
7,	7.1	5580	....	......	....	†1450	5.1	2740	3.5	950	4.8	2330	....	......	2.15	239	1.81	137	2.35	311	3.35	835	4.6	2080
8,	12.5	18800	....	......	....	†1300	4.8	2330	3.45	910	4.4	1850	....	......	2.1	222	1.84	145	2.35	311	3.4	870	4.5	1960
9,	9.9	12000	....	......	....	†1550	4.7	2200	3.35	835	3.8	1220	....	......	1.98	184	1.80	134	2.3	292	8.8	10200	4.8	2330
10,	7.7	6810	....	......	4.4	1850	4.4	1850	3.25	765	3.6	1040	....	......	....	160	1.78	129	2.25	274	10.1	13400	5.0	2600
11,	7.0	5390	....	......	4.2	1630	4.6	2080	3.15	700	3.5	950	....	......	....	150	1.74	120	2.2	256	7.4	6950	....	......
12,	7.4	6180	....	......	4.4	1850	6.7	4830	3.15	700	3.4	870	....	......	....	140	1.73	117	2.15	239	6.8	5650	....	......
13,	6.7	4830	....	......	4.1	1520	5.7	3660	3.05	640	3.3	800	....	......	....	130	1.70	110	2.15	239	6.2	4500	....	......
14,	5.9	3990	....	......	7.3	5980	5.6	3500	3.0	610	3.05	640	....	......	....	125	1.69	108	2.05	206	5.5	3340	....	......
15,	5.6	3500	....	......	7.9	7230	5.3	2040	2.95	583	2.95	583	....	......	....	120	1.68	106	2.15	239	5.0	2600	....	......
16,	5.4	3190	....	......	7.3	5980	5.0	2600	2.9	556	2.85	530	....	......	....	115	1.67	103	2.3	292	4.9	2470	....	......
17,	6.1	3810	....	......	6.3	4130	4.8	2330	2.85	530	2.8	504	....	......	....	115	1.66	101	2.35	311	4.8	2330	....	......
18,	6.7	4830	....	......	5.5	3340	4.6	2080	2.8	504	2.75	480	....	......	....	110	1.66	101	2.3	292	4.8	2330	....	......
19,	6.8	5010	....	......	....	*3040	4.4	1850	2.8	504	2.65	434	....	......	....	105	1.69	108	2.3	292	4.7	2200	....	......
20,	6.5	4470	....	......	....	*3820	4.2	1630	2.85	530	2.8	504	....	......	....	100	1.74	120	3.6	1040	4.7	2200	....	......
21,	6.8	5010	....	......	6.3	4130	4.1	1520	3.05	640	2.6	412	....	......	....	100	1.81	137	4.7	2200	4.6	2080	....	......
22,	6.2	3970	....	......	6.5	4470	3.9	1320	3.1	670	2.6	412	....	......	2.65	434	....	1630	4.6	2080	4.6	2080	....	......
23,	5.7	3660	....	......	5.8	3820	3.8	1220	3.4	870	2.55	391	....	......	2.4	330	....	1630	4.3	1740	4.6	2080	....	......
24,	6.0	3650	....	......	6.1	3810	3.8	1220	3.7	1130	2.5	370	....	......	2.0	190	....	1470	....	1220	4.8	2330	....	......
25,	5.6	3500	....	......	6.3	4130	3.7	1130	3.7	1130	2.45	350	....	......	1.94	173	....	1040	....	1130	5.0	2600	....	......
26,	5.2	2890	....	......	8.9	9490	3.6	1040	3.6	1040	2.4	330	1.81	137	1.88	156	3.0	610	....	1320	4.8	2330	....	......
27,	5.0	2600	....	......	14.9	25600	3.5	950	3.5	950	2.35	311	1.79	132	1.85	148	2.6	412	5.1	2740	4.6	2080	....	......
28,	4.7	2200	....	......	12.7	19400	4.4	870	5.8	3820	2.3	292	2.05	206	1.81	137	2.45	350	4.3	1740	4.5	1960	....	......
29,	4.5	1960	....	......	8.9	9490	5.2	2890	5.9	3990	2.3	292	2.2	256	2.3	292	2.35	311	3.8	1220	4.4	1850	....	......
30,	4.4	1850	....	......	7.4	6180	4.7	2200	5.6	3500	2.25	274	1.95	176	2.35	311	2.35	311	3.6	1040	4.4	1850	....	......
31,	4.2	1630	....	......	6.8	5010	....	......	5.1	2740	....	......	1.75	122	2.05	206	....	......	3.6	1040	......	......	....	......

*Discharge estimated from one gage height reading. Stage variable.

†Discharge estimated by comparison with West Br. Delaware river at Hale Eddy.

Gage readings above 6.0 ft. before Aug. 31 observed on gages at **highway** bridge. Other observations on gage at regular section. Observations suspended February 2 to 28 inclusive on account of ice. No gage height records July 1 to 25, August 10 to 21, and December 11 to 31 inclusive.

Estimated mean discharge July 1 to 25 inclusive—190 sec. ft. from Hancock, N. Y., gage heights.

August 10 to 21 estimated by use of W. B. gage heights at Hancock, N. Y. Estimated mean Dec. 11 to 31—1600 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF EAST BRANCH DELAWARE RIVER, AT FISH EDDY, N. Y.

(Drainage area 790 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1912.					
November,	....	....	1020	1.29	.576
December,	7450	800	2330	2.95	3.40
a1913.					
January,	18800	1630	4810	6.09	7.02
February,	....	....	870	1.10	1.14
March,	25600	1300	5000	6.33	7.30
April,	5010	870	2390	3.03	3.38
May,	3990	504	1160	1.47	1.70
June,	4300	274	1030	1.30	1.45
July,	....	122	186	.235	.27
August,	434	....	180	.228	.26
September,	1630	101	345	.437	.49
October,	2740	206	792	1.00	1.15
November,	13400	835	2880	3.65	4.07
December,	....	....	1730	2.19	2.52
The year,	....	....	1790	2.27	30.75

Note.—a Discharge for February, July 1 to 25, inclusive, and December 11 to 31, inclusive, estimated from records on this stream at Hancock and Port Jervis.

WALLENPAUPACK CREEK.

DESCRIPTION OF BASIN.

Wallenpaupack creek, the largest and most important tributary of the Lackawaxen river, rises in the Pocono Plateau in the northern part of Monroe county, and flows in a general northeasterly direction forming the boundary between Pike and Wayne counties, for approximately 30 miles, to its mouth at Hawley, the total drainage area being 240 square miles, comprising 40 per cent. of the drainage area of the Lackawaxen river.

Its many tributaries quite generally rise in glacial lakes or swamps, and, falling rapidly, join the main stream, whose slope is very flat for many miles to within a mile of its mouth. Its source is at an approximate elevation of 2,100 feet, and for 17 miles the slope is rapid, averaging 56 feet per mile to Ledgedale, 13 miles above the mouth. From Wilsonville, one mile above the mouth, it descends 285 feet to the Lackawaxen river over a series of falls and rapids, while above that point the fall is less than 10 feet in 12 miles, thus affording a fortunate combination for water storage and the generation of water power.

The valley below Ledgedale is wide and swampy, while the rolling hillsides are quite largely under cultivation. Along some of the tributaries, and in the main valley, is a certain amount of timber. The watershed is comparatively narrow for some 15 miles above its mouth, widening out above to follow its numerous upper tributaries in Wayne, Pike and Monroe counties. The drainage area is sparsely inhabited and contains practically no settlements.

The creek and its tributaries are not used for water supply purposes, and to a limited extent for water power below Wilsonville.

The average yearly rainfall over the watershed is approximately 43 inches.

The flow has been measured since July 3, 1908, at Wilsonville, one mile above the mouth.

DELAWARE BASIN—STATION NO. 3.

WALLENPAUPACK CREEK AT WILSONVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, steel, through-truss, highway bridge at Wilsonville, 1½ miles above Hawley, Wayne Co., Pa.

RECORDS AVAILABLE—Discharge measurements and gage heights from July 3, 1908, to December 31, 1913, except at times when flash boards are placed on the dam.

DRAINAGE AREA—240 square miles.

GAGE—A 12 foot staff gage is bolted to the downstream face of the pier. During the summer of 1913, a Barrett & Lawrence automatic gage was attached to the bridge on the same datum as the staff gage. The elevation of zero is arbitrary. Bench Mark No. 1 is a small projection on right abutment, downstream corner, 5.2 feet down from bridge seat, elevation 3.923 ft. above gage datum. Bench mark No. 2 is the highest point on round stone 3.3 feet from telegraph pole and 9.0 feet from downstream corner of right abutment, elevation 6.16 ft. above gage datum. The staff gage was read by Mrs. George Heickelbeck, and the automatic gage by employees of L. B. Stillwell, who maintains and operates this gage.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is top edge of bridge seat, left abutment, downstream side.

CHANNEL—The channel above and below the station is straight for 300 feet and 200 feet respectively. The right bank overflows for a space of several hundred feet in width during extreme high stages. The left bank does not overflow. The bed consists of solid rock.

REMARKS—During low water, gage readings have to be discontinued on account of storage of water during night by placing of flashboards on the low dam 65 ft. downstream. However, during the summer of 1913, a 3.2 ft. dam, upon which flashboards are placed, was erected 35 ft. above the highway bridge, and the lower dam converted into a weir for the measurement of the discharge of the stream.

DISCHARGE MEASUREMENTS OF WALLENPAUPACK CREEK, AT WILSONVILLE, WAYNE COUNTY, PA.

(Drainage area 240 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1912							
10	May 22	La Bar & Volz, ...	115	247	1.92	1.38	474	
11	May 28	La Bar & Volz, ...	112	213	1.25	1.05	266	
12	July 1	Langenheim, ...	114	358	0.32	2.31	114	Surface measurement. Flash boards on dam.
	1913							
13	March 28	La Bar & Volz, ...	150	611	6.66	4.1	4068	
14	May 7	Colt & Volz, ...	117	252	1.62	1.48	408	
15	May 19	La Bar & Volz, ...	115	196	0.96	1.11	188	

DAILY MEAN GAGE HEIGHTS OF WALLENPAUPACK CREEK AT WILSONVILLE, PIKE COUNTY, PA.

1913. DAY.	JAN.	FEB.	MAR.	APR.	MAY.	JUNE.	OCT.	NOV.	DEC.
	G H	G H	G H	G H	G H	G H	G H	G H	G H
1,	2.28	1.55	1.80	2.50	2.30	1.45	1.34	1.55	2.06
2,	2.45	1.53	1.60	2.35	2.15	1.28	1.46	1.52	1.96
3,	2.32	1.50	1.40	2.18	2.00	1.25	1.52	1.50	1.91
4,	2.50	1.40	1.40	2.09	1.84	1.18	1.53	1.48	1.88
5,	3.00	1.55	1.40	1.98	1.68	1.10	1.22	1.45	1.80
6,	2.75	1.50	1.40	1.88	1.58	1.05	1.33	1.43	1.72
7,	2.74	1.40	1.25	1.78	1.53	1.05	1.43	1.43	1.72
8,	2.73	1.40	1.25	1.68	1.43	1.05	....	1.29	2.11
9,	3.07	1.37	1.25	1.58	1.35	1.05	....	1.55	2.25
10,	2.98	1.35	1.30	1.50	1.30	1.00	....	....	1.98
11,	2.60	1.30	1.52	1.50	1.30	0.95	....	....	1.93
12,	2.52	1.20	1.48	1.85	1.30	0.95	....	....	1.92
13,	2.45	1.15	1.48	2.12	1.25	0.90	....	....	1.91
14,	2.18	1.15	1.48	2.40	1.20	0.85	....	....	1.90
15,	1.91	1.15	2.20	2.40	1.20	0.82	....	....	1.81
16,	1.63	1.15	2.57	2.28	1.15	0.80	....	....	1.81
17,	1.86	1.15	2.38	2.20	1.13	0.80	......	....	1.81
18,	2.10	1.10	2.15	2.20	1.12	0.80	....	....	1.77
19,	2.12	1.10	1.95	1.95	1.11	0.78	....	....	1.73
20,	2.13	1.10	1.85	1.82	1.11	0.75	....	2.14	1.70
21,	2.10	1.10	2.03	1.70	1.08	0.98	1.86	2.06	1.72
22,	2.10	1.10	2.03	1.60	1.10	0.91	1.94	1.98	1.75
23,	2.03	1.35	1.93	1.55	1.15	0.85	1.71	1.95	1.70
24,	1.95	1.50	1.82	1.50	1.60	0.80	1.55	1.92	1.90
25,	1.90	1.56	1.78	1.50	1.58	0.78	1.52	1.86	1.90
26,	1.92	1.20	1.75	1.50	1.65	0.76	1.72	1.83	1.95
27,	1.95	1.20	2.10	1.59	1.38	0.75	....	1.82	1.85
28,	1.95	1.50	4.05	1.68	1.38	0.75	1.89	1.79	1.85
29,	1.85	....	3.70	2.00	1.73	0.75	1.72	1.82	1.85
30,	1.75	....	3.75	2.25	1.67	0.75	1.65	2.00	1.85
31,	1.65	....	3.65	....	1.60	....	1.61	....	1.35

NOTE.—July 1-Sept. 30; Oct. 8-20, and Nov. 10-19, no readings taken on account of flash boards being placed on dam.

SHOHOLA CREEK.

DESCRIPTION OF BASIN.

Shohola creek, a tributary of the Delaware river, and one of the largest joining that stream in Pike county, drains about 90 square miles of mountainous, forested and practically uninhabited territory in the northern portion of that county. It rises on the eastern slope of the Pocono mountains at an elevation of approximately 1,800 feet above sea level, in many lakes and ponds, abutting the watersheds of Bushkill, Wallenpaupack and Raymondskill creeks, and flows first in a general easterly direction through a glaciated country, with comparatively steep slopes, alternating with occasional swampy areas. About 12 miles above its mouth the stream turns to the northeast and enters a broad, flat, ancient lake bed, some five miles long, the maximum width being over one mile, lying at an elevation of approximately 1,150 feet above sea level. The current in this section of the stream is sluggish and the valley flat and swampy. At the outlet of this swamp a low earth dam has been erected 10 or 15 feet high, which forms an extensive lake in the lower portion of the swamp, and is used for floating logs. Immediately below the outlet of the swamp the stream falls over a hard sandstone ledge, descending in an abrupt fall about 75 feet, and continues for about 6 miles to its mouth through a steep and narrow valley, falling in this distance about 600 feet from the head of the falls to the Delaware river. For the most part, this valley is wild, gorge like and uninhabited, but near the mouth are a few farms, where the valley widens and, at the mouth up on the river bluffs, is the town and railroad station of Shohola.

The main tributaries are Rattlesnake Brook, coming in about two miles above the falls from the south and draining about 13 square miles, and Greeley creek, coming in about two miles below the falls from the north, and draining about 15 square miles. The entire stream is at present unused except for logging. The numerous lakes on the watershed, together with many springs which feed it, contribute to make a considerable flow throughout the dry seasons.

The mean annual precipitation over this watershed is approximately 43 inches.

The flow has been measured since September 22, 1911, at Lords Valley, 15 miles above the mouth, at which point the tributary drainage area is approximately 32 square miles.

DELAWARE BASIN—STATION NO. 4.

SHOHOLA CREEK AT LORDS VALLEY, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, iron highway bridge, at Lords Valley, Pike Co.

RECORDS AVAILABLE—Discharge measurements and gage heights September 22, 1911, to August 9, 1913. Station temporarily discontinued on August 10, 1913, on account of repairs to bridge.

DRAINAGE AREA—32 square miles.

GAGE—A sectional chain gage is fastened to the guardrail on the upstream side of the bridge. The elevation of zero is arbitrary. The length of chain from bottom of weight to marker is 12.945 feet. Bench Mark No. 1 is top stone of upstream corner of left abutment, cut out with cross, and B. M. cut in stone on top elevation 9.90 feet above gage datum. The gage is read twice daily by Oswald Vennie.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading. Wading measurements are preferable during medium and low stages. The initial point for soundings is left end of downstream handrail.

CHANNEL—The channel is straight both above and below the station, but the thread of the stream passes under the bridge at a slight angle. The right bank is high and not subject to overflow, while the left bank is high, but will probably overflow during extreme high stages. The bed is of rocks and gravel.

REMARKS—There is an old mill dam about 400 feet below the gaging station which, however, does not back water up to the gage.

DISCHARGE MEASUREMENTS OF SHOHOLA CREEK, AT LORDS VALLEY, PIKE COUNTY, PA.

(Drainage area 32 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
4	July 31	Boehringer, ...	14	6.9	0.60	4.20	4.14	Wading msmt. above bridge.

DAILY MEAN GAGE HEIGHTS OF SHOHOLA CREEK AT LORDS VALLEY, PIKE COUNTY, PA.

1913.	JAN.	FEB.	MAR.	APR.	MAY.	JUNE.	JULY.	AUG.
DAY.	G H	G H	G H	G H	G H	G H	G H	G H
1,	5.26	5.14	5.00	5.53	5.31	4.94	4.34	4.36
2,	5.12	5.10	4.93	5.37	5.20	4.88	4.39	4.38
3,	5.48	5.00	4.93	5.53	5.16	4.85	4.39	4.28
4,	5.58	5.00	4.80	5.38	5.09	4.80	4.39	4.29
5,	5.52	5.05	4.80	5.39	5.05	4.77	*4.38	4.27
6,	5.48	5.18	4.83	5.39	5.03	4.71	*4.37	*4.24
7,	5.46	5.52	4.98	5.35	5.03	4.72	4.36	*4.20
8,	5.54	5.74	4.93	5.25	4.99	4.73	4.34	4.16
9,	5.56	5.00	4.82	5.21	4.95	4.69	4.37	4.13
10,	5.52	5.08	4.83	5.07	4.89	4.68	4.43	....
11,	5.50	5.12	5.13	5.19	4.87	4.64	4.34	....
12,	5.51	5.06	5.02	5.51	4.89	4.60	4.33	....
13,	5.48	5.30	4.97	5.61	4.81	4.58	4.43	....
14,	5.44	5.22	5.60	5.59	4.83	4.55	4.36	....
15,	5.28	4.80	5.60	5.51	4.75	4.56	4.32	....
16,	5.28	4.75	5.58	5.43	4.79	4.49	4.23	....
17,	5.40	4.75	5.50	5.41	4.78	4.48	4.25	....
18,	5.37	4.85	5.29	5.31	4.73	4.48	4.28	....
19,	5.34	4.70	5.36	5.25	4.75	4.45	4.25	....
20,	5.23	4.70	5.50	5.17	4.70	4.48	4.32	....
21,	5.28	4.77	5.52	5.13	4.71	4.88	4.30	....
22,	5.16	4.87	5.42	5.09	4.75	4.58	4.31	....
23,	5.16	5.14	5.32	5.10	4.98	4.51	4.32	....
24,	5.31	4.99	5.33	5.06	5.61	4.44	4.47	....
25,	5.22	4.91	5.29	5.07	5.24	4.44	4.38	....
26,	5.18	4.89	5.44	4.97	4.99	4.42	4.39	....
27,	5.14	4.77	6.28	5.44	4.92	4.44	4.35	....
28,	5.11	5.17	6.58	5.59	5.21	4.43	*4.32	....
29,	5.07	....	5.79	5.49	5.29	4.42	*4.29	....
30,	5.04	....	5.52	5.37	5.14	4.34	4.26	....
31,	5.05	....	5.58	....	4.97	....	4.17	....

*Interpolated.

RATTLESNAKE BROOK.

DESCRIPTION OF BASIN.

Rattlesnake Brook is one of the largest tributaries of Shohola creek, joining that stream about two miles above the falls, and about 8 miles above its mouth, coming in from the south and draining a wild and uninhabited area of about 13 square miles. The valley of this stream is flat and swampy for three or four miles above its mouth, rising then abruptly to its sources, which are at an elevation of about 1,600 feet above sea level, where it meets the headwaters of the Bushkill and Raymondskill creeks and flows in a general northerly direction to its mouth. The stream is approximately 8 miles long.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since September 22, 1911, at the crossing of the Spring Brook road, about two miles above the mouth of the stream.

DELAWARE BASIN—STATION NO. 5

RATTLESNAKE BROOK AT SPRING BROOK, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, open wooden bridge, 2 miles above the mouth, on the Spring Brook Road, Pike Co.

RECORDS AVAILABLE—Discharge measurements and gage heights from September 22, 1911, to December 31, 1913.

DRAINAGE AREA—11 square miles.

GAGE—A 5½ foot staff gage is attached to the right log abutment. The elevation of zero is arbitrary. Bench Mark No. 1 is on nail in root of swamp maple, 2 feet in diameter, 18 paces from center of bridge on right bank, nail in root facing road and nearest bridge, tree burned on side nearest road, also rotted on same side, elevation 4.05 feet above gage datum. The gage is read twice daily by August Tampier.

DISCHARGE MEASUREMENTS—Taken from the upstream side of the bridge, and by wading. The initial point for soundings is face of logs forming left abutment.

CHANNEL—The channel above and below the station is straight for approximately 30 feet and 80 feet respectively. Both banks are high and not subject to overflow. The bed is composed of gravel and mud.

DISCHARGE MEASUREMENTS OF RATTLESNAKE BROOK, AT SPRING BROOK, PIKE COUNTY, PA.

(Drainage area 11 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
5	July 31	Boehringer, ...	16	26	0.12	0.88	3.04	Surface msmt.

DAILY MEAN GAGE HEIGHTS OF RATTLESNAKE BROOK AT SPRING BROOK, PIKE COUNTY, PA.

1913.	JAN.	FEB.	MARCH.	APRIL.	MAY.	JUNE.	JULY.	AUGUST.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	2.12	1.90	1.88	2.40	2.14	1.52	0.98	0.88	0.85	0.90	1.28	1.65
2,	2.12	1.83	1.66	2.32	2.02	1.44	0.97	1.08	0.80	1.49	1.26	1.62
3,	2.20	1.78	1.67	2.36	1.91	1.42	0.93	1.07	0.77	1.38	1.22	1.58
4,	3.04	1.83	1.60	2.28	1.82	1.41	0.91	1.04	0.76	1.24	1.20	1.54
5,	2.90	1.75	1.56	2.22	1.77	1.40	0.89	0.95	0.76	1.16	1.20	1.48
6,	2.76	1.68	1.55	2.12	1.67	1.34	0.94	0.90	0.76	1.09	1.18	1.43
7,	2.48	1.66	1.55	2.04	1.66	1.33	0.99	0.88	0.76	1.03	1.17	1.42
8,	2.83	1.65	1.56	1.94	1.64	1.35	0.97	0.87	0.76	0.94	1.15	1.45
9,	2.88	*1.64	1.49	1.86	1.62	1.31	0.93	0.86	0.76	0.94	1.64	1.42
10,	2.48	1.63	1.46	1.83	1.60	1.30	0.93	0.86	0.76	0.92	1.57	1.40
11,	2.39	1.62	1.66	1.92	1.58	1.28	0.92	0.86	0.76	0.94	2.87	1.40
12,	2.52	1.61	1.78	2.72	1.52	1.26	0.91	0.85	0.76	1.09	2.86	1.40
13,	2.43	1.58	1.68	2.44	1.52	1.24	0.99	0.85	0.76	1.04	2.74	1.40
14,	2.23	1.52	2.64	2.40	1.48	1.20	0.97	0.84	0.76	1.02	2.60	1.40
15,	2.11	1.52	2.71	2.32	1.42	1.16	0.96	0.84	0.76	0.99	2.44	1.40
16,	2.08	1.51	2.66	2.22	1.41	1.10	0.91	0.83	0.76	0.96	2.30	1.40
17,	2.20	1.50	2.42	2.14	1.40	1.08	0.89	0.83	0.76	0.94	2.21	1.40
18,	2.23	1.48	2.24	2.10	1.39	1.08	0.89	0.83	0.76	0.94	2.11	1.40
19,	2.20	1.48	2.16	1.94	1.36	1.08	0.89	0.86	0.78	0.94	1.97	1.40
20,	2.14	1.47	2.46	1.90	1.35	1.08	0.88	0.86	0.78	1.56	1.82	1.39
21,	2.10	1.49	2.56	1.86	1.32	1.10	0.88	0.84	0.78	1.52	1.74	1.39
22,	2.08	1.68	2.48	1.79	1.32	1.14	0.88	0.84	1.69	1.49	1.71	1.38
23,	2.03	1.88	2.22	1.74	1.37	1.10	0.88	0.84	1.38	1.34	1.67	1.45
24,	2.10	1.67	2.16	1.73	2.40	1.09	0.99	0.83	1.25	1.24	1.62	2.04
25,	2.02	1.63	2.15	1.72	2.32	1.04	1.01	0.83	1.22	1.73	1.60	1.98
26,	1.97	1.61	2.40	1.68	2.24	1.02	0.99	0.82	1.01	1.84	1.57	1.92
27,	1.96	1.50	3.46	1.64	2.07	1.01	0.98	0.81	0.90	1.62	1.56	1.91
28,	1.88	1.84	3.58	2.44	1.97	1.00	0.93	0.80	0.86	1.54	1.52	1.85
29,	1.86	....	3.15	2.29	1.93	1.00	0.89	0.82	0.86	1.42	1.52	1.80
30,	1.82	....	3.12	2.24	1.82	1.00	0.89	0.90	0.86	1.34	1.72	1.68
31,	1.81	....	2.81	....	1.62	....	0.88	0.88	....	1.32	....	1.65

*Creek frozen Feb. 9-21 inclusive.

DELAWARE RIVER.

DESCRIPTION OF BASIN.

The Delaware river rises at an elevation of about 1,900 feet above sea level, in two branches, in the Catskill mountains of eastern New York, which flow southwesterly and unite at Hancock on the New York-Pennsylvania boundary, at an elevation of 895 feet. From this point a generally southerly course is followed to the mouth in Delaware Bay, the river forming the eastern boundary of Pennsylvania, and dividing it from New York for 60 miles and from New Jersey for 170 miles.

The total length of the river is approximately 410 miles, and its drainage area above the Pennsylvania-Delaware line is 10,900 square miles. The major tributaries are the Lackawaxen, Lehigh and Schuylkill rivers, and numerous large creeks from Pennsylvania, Neversink river from New York, and Flat Brook, Paulins Kill, Pequest, Lepatcong, Pohatcong and Musconetong rivers from New Jersey.

Its upper section is in a mountainous, sparsely inhabited and well timbered region, continuing through northern Pennsylvania and New Jersey. After cutting through the Kittatinny ridge at Delaware Water Gap it emerges into the broader valley below, where the population becomes more dense, and the land more largely cultivated.

Above Trenton, the head of tidewater, 30 miles above Philadelphia, the stream is generally swift and shallow, flowing on a rocky bed with numerous riffles and several considerable rapids. The slope from the northern boundary of New Jersey to Trenton is 3.5 feet per mile, and above this point to the Pennsylvania-New York line it averages 6 feet per mile. The upper section is in the once glaciated region and the tributaries drain numerous lakes, ponds and swampy areas throughout New York, upper Pennsylvania and New Jersey.

The stream is used considerably in its lower section for domestic and industrial supply in New Jersey and Pennsylvania, but the water power opportunities of the upper Delaware, although considerable, are undeveloped.

In Pennsylvania the cities of Philadelphia, Easton and Chester lie on the river banks, while on tributaries are South Bethlehem, Allentown, Norristown, Pottstown, Reading, Pottsville and many smaller communities.

A portion of the anthracite coal region lies at the headwaters of the Schuylkill and Lehigh rivers, and a large limestone area is drained by the lower tributaries of these streams.

The Delaware basin in Pennsylvania is subject to an average annual precipitation of 46.1 inches, the upper part receiving 35 to 40 inches, and the major portion lying within the 45 to 50 inch zone. The area of highest precipitation in the State, 50 to 55 inches, lies at the headwaters of the Schuylkill river.

The discharge has been measured at Riegelsville, N. J. and Port Jervis, N. Y., the former since July 3, 1906, and the latter since October 12, 1904. A station was operated at Lambertville from July 22, 1897, to April 1, 1908.

DELAWARE BASIN—STATION NO. 6.

DELAWARE RIVER AT PORT JERVIS, N. Y.

DESCRIPTION OF STATION.

LOCATION—On two span, steel, through-truss, highway bridge, between Port Jervis, N. Y., and Matamoras, Pa.

RECORDS AVAILABLE—Discharge complete from October 12, 1904, to December 31, 1912; discharge measurements and gage heights for 1913.

DRAINAGE AREA—3,250 square miles.

GAGE—A standard chain gage is bolted to the downstream hand-rail, right span near center pier. The elevation of zero is 414.89 feet above mean sea level. The length of chain from bottom of weight to marker is 36.52 feet. Bench Mark No. 1 is cross on door sill of school house on Thompson Street near Water Street, Port Jervis, N. Y., elevation 27.75 feet above gage datum. Bench Mark No. 2 is top of downstream left corner of pier of toll bridge, elevation 29.92 feet above gage datum. Bench Mark No. 3 is top of right abutment of toll bridge at apex of angle caused by junction of downstream wing-wall, elevation 29.02 feet above gage datum. The gage is read once daily by Jacob Miller.

DISCHARGE MEASUREMENTS—Taken from either the upstream or downstream side of the bridge. Initial point for soundings is top of bridge seat, Port Jervis abutment.

CHANNEL—The channel above and below the station is straight. Both banks are high and not subject to overflow. The bed is composed of gravel.

REMARKS—The following data have been furnished by the United States Geological Survey. Because of inconsistent plotting of low water measurements in 1913, it is deemed advisable to withhold 1913 final computations until additional measurements can be obtained to verify apparent changes in the curves.

DISCHARGE MEASUREMENTS OF DELAWARE RIVER, AT PORT JERVIS, N. Y.

(Drainage area 3250 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
38	March 29	Weber, ...	631	5770	5.72	9.09	33000	0.2 & 0.8 method.
39	May 13	DeGolyer, ...	552	2040	1.18	2.65	2420	0.2 & 0.8 method.
40	Aug. 1	Boehringer, ...	334	500	0.99	1.28	494	Wading msmt. 1000′ below bridge.
41	Aug. 9	Canfield, ...	370	991	0.65	1.41	640	0.2 & 0.8 method.

DAILY MEAN GAGE HEIGHTS OF DELAWARE RIVER AT PORT JERVIS, N. Y.

1913.	JAN.	FEB.	MARCH.	APRIL.	MAY.	JUNE.	JULY.	AUGUST.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	5.5	4.0	7.0	6.6	4.7	4.4	1.5	1.3	1.2	1.4	2.6	3.3
2,	4.8	4.1	5.3	6.2	4.4	4.0	1.6	1.3	1.2	1.8	2.3	3.2
3,	4.6	4.2	4.4	5.4	4.1	3.6	1.3	1.3	1.2	2.2	2.1	3.1
4,	8.0	3.8	4.2	5.4	4.0	3.4	1.4	1.2	1.1	1.6	2.1	3.1
5,	7.1	3.4	4.0	5.5	3.7	4.2	1.5	1.1	1.1	1.4	2.1	3.1
6,	6.0	3.4	3.8	5.3	3.7	3.9	1.7	1.1	1.1	1.6	2.1	3.0
7,	5.6	3.2	3.4	4.9	3.4	3.2	1.5	1.7	1.1	1.6	2.1	3.0
8,	5.6	3.0	3.1	4.6	3.3	3.5	1.5	1.2	1.1	1.6	2.1	3.9
9,	11.0	3.0	2.7	4.4	3.3	3.2	1.4	1.4	1.1	1.6	2.8	3.9
10,	7.8	2.8	3.3	4.1	3.2	2.9	1.4	1.2	1.1	1.6	9.7	3.7
11,	6.8	2.9	4.0	4.1	2.8	2.7	1.4	1.5	1.1	1.5	7.3	3.7
12,	6.7	3.0	4.5	6.2	2.7	2.6	1.4	1.3	1.1	1.6	6.1	3.4
13,	7.4	2.7	4.4	5.2	2.6	2.6	1.4	1.2	1.1	1.8	5.3	3.4
14,	7.0	2.7	4.3	5.9	2.6	2.5	1.4	1.2	1.1	1.7	4.7	3.3
15,	5.6	2.7	8.0	5.6	2.4	2.3	1.5	1.2	1.1	1.5	4.6	3.4
16,	5.3	2.9	7.3	5.2	2.4	2.3	1.4	1.2	1.1	1.5	4.3	3.3
17,	5.0	2.9	6.5	4.9	2.4	2.2	1.4	1.2	1.0	1.5	4.1	3.3
18,	5.9	2.8	5.7	4.5	2.4	2.3	1.4	1.2	1.0	1.5	3.8	3.2
19,	6.3	2.8	5.1	4.4	2.4	2.2	1.3	1.4	1.0	1.5	4.2	3.2
20,	6.1	2.7	4.9	4.2	2.4	2.2	1.3	1.3	1.0	1.6	4.0	3.1
21,	5.5	2.7	5.9	3.9	2.3	2.2	1.2	1.2	1.0	2.5	3.9	3.1
22,	6.2	2.7	5.6	3.7	2.5	2.2	1.2	1.1	1.6	4.0	3.8	2.9
23,	5.4	3.2	5.7	3.5	2.5	2.2	1.2	1.2	2.5	3.4	3.5	2.9
24,	5.2	3.9	5.2	3.4	3.8	2.2	1.3	1.2	2.7	3.4	3.4	3.1
25,	5.4	4.0	5.6	3.0	4.0	2.0	1.3	1.1	2.5	3.6	3.2	3.3
26,	5.0	3.4	5.7	3.0	3.8	1.9	1.3	1.1	1.9	3.6	3.1	3.3
27,	4.7	3.0	9.3	3.0	3.4	1.8	1.3	1.0	1.7	4.0	3.1	3.1
28,	4.5	3.4	15.0	3.5	3.3	1.8	1.2	1.1	1.6	3.4	3.1	3.2
29,	4.4	....	10.0	5.5	4.3	1.7	1.4	1.1	1.5	3.3	3.3	2.2
30,	4.0	....	7.9	5.3	5.8	1.6	1.4	1.4	1.4	3.0	3.4	2.8
31,	4.0	....	6.9	....	4.7	....	1.4	1.3	....	2.8	....	2.7

BIG BUSHKILL CREEK.

DESCRIPTION OF BASIN.

Big Bushkill creek, a large tributary of the Delaware river in Monroe and Pike counties, drains an area of approximately 150 square miles. Rising in many lakes and ponds on the Pocono mountains, in the south central part of Pike county, it flows southerly through an uninhabited region covered with heavy second growth and some virgin timber to within a few miles of its mouth at Bushkill, the length being approximately 25 miles. The principal tributaries are Wells, Middle Bushkill and Little Bushkill creeks, the watershed including numerous lakes, ponds and swamps, and lying entirely within the glacial area. On Bushkill creek and its tributaries are numerous falls and rapids, most noted of which are Bushkill Falls on Little Bushkill creek and Winono Falls on the main stream, while all the streams are rapid below the falls, flowing over rocky beds within steep, precipitous banks, while above the slopes are flatter and swampy areas abound.

Bushkill village, at its mouth, is the only town within this basin. This creek and its tributaries are used to some extent on the lower reaches for power purposes by grist mills, while sites for considerable powers are as yet undeveloped.

The mean annual precipitation over this watershed is from 45 to 50 inches. The flow has been measured since September 19, 1908, at Shoemakers, 3 miles above the mouth.

DELAWARE BASIN—STATION NO. 7.

BIG BUSHKILL CREEK AT SHOEMAKERS, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, two miles upstream from village of Bushkill, Pike county.

RECORDS AVAILABLE—Discharge complete from September 19, 1908, to December 31, 1913.

DRAINAGE AREA—115 square miles.

GAGE—A chain gage is fastened to the guard-rail on the upstream side of the bridge. The elevation of zero is arbitrary. The length of chain from bottom of weight to marker is 14.39 feet. Bench Mark No. 1 is a point on the upstream corner of the left abutment, top of fifth course from bottom, eight course down from top of bridge, elevation 5.625 feet above gage datum. It is read once daily by George Beaver.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading at a section 2,000 feet below bridge at low stages. The initial point for soundings is end of handrail at left bank, downstream side.

CHANNEL—The channel above and below the station is straight for 350 and 800 feet respectively. The right and left banks are high and not subject to overflow. The bed is composed of gravel with several large rocks. Ice conditions exist for short periods during the year.

DISCHARGE MEASUREMENTS OF BIG BUSHKILL CREEK, AT SHOEMAKERS, MONROE COUNTY, PA.

(Drainage area 115 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
11	1913 July 30	Boehringer, ...	61	40	0.55	1.11	22	Wading measurement.

DISCHARGE TABLE FOR BIG BUSHKILL CREEK, AT SHOEMAKERS, MONROE COUNTY, FROM SEPT. 19, 1908.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
.90	6	.80	160	.70	596	.60	1455	.50	2445
1.00	12	.90	195	.80	672	.70	1565	.60	2555
.10	20	2.00	233	.90	750	.80	1675	.70	2665
.20	31	.10	273	3.00	838	.90	1785	.80	2775
.30	44	.20	317	.10	928	4.00	1895	.90	2885
.40	60	.30	364	.20	1025	.10	2005	5.00	2995
.50	79	.40	415	.30	1130	.20	2115		
.60	102	.50	469	.40	1237	.30	2225		
.70	128	.60	529	.50	1346	.40	2335		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BIG BUSHKILL CREEK AT SHOEMAKERS, MONROE COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	2.30	364	2.03	245	2.31	369	2.79	664	2.33	379	2.08	265	1.28	41	1.10	20	1.12	22	1.48	75	1.88	188	1.96	218
2,	2.23	331	2.00	233	2.14	291	2.74	626	2.24	336	2.03	245	1.28	41	1.63	110	1.05	16	1.88	188	1.86	181	1.88	188
3,	2.50	469	2.10	273	2.07	261	2.55	499	2.18	308	1.98	225	1.27	40	1.40	60	1.03	14	1.76	147	1.83	170	1.86	181
4,	2.90	750	2.08	265	1.99	229	2.51	475	2.08	265	1.94	210	1.23	35	1.32	47	0.95	9	1.63	110	1.81	164	1.83	170
5,	2.70	596	2.05	253	1.89	192	2.47	453	2.00	233	1.78	154	1.20	31	1.20	31	1.00	12	1.54	88	1.78	154	1.78	154
6,	2.56	505	*2.30	364	1.85	178	2.29	359	1.98	225	1.73	138	1.46	71	1.16	27	1.08	18	1.48	75	1.73	138	1.74	141
7,	2.52	481	2.25	340	1.84	174	2.24	336	2.08	265	1.70	128	1.34	50	1.16	27	1.10	20	1.41	62	1.68	123	1.88	188
8,	2.78	657	†2.55	499	†2.00	233	2.21	322	2.06	257	1.78	154	1.26	39	1.16	27	1.12	22	1.96	218	1.68	123	2.16	299
9,	2.90	750	2.32	374	1.87	184	2.17	304	2.02	241	1.81	164	1.23	35	1.15	26	1.05	16	1.48	75	2.28	355	2.03	245
10,	2.70	596	2.30	364	1.82	167	2.13	286	1.98	225	1.73	138	1.50	79	1.14	24	1.03	14	1.43	66	2.63	549	1.96	218
11,	2.60	529	2.36	395	1.96	218	2.19	313	1.96	218	1.68	123	1.36	54	1.12	22	1.00	12	1.36	54	2.48	458	1.93	206
12,	2.56	505	2.30	364	1.94	210	2.79	664	1.93	206	1.66	118	1.28	41	1.10	20	1.00	12	1.78	154	2.40	415	1.90	195
13,	2.53	487	2.28	355	1.89	192	2.64	556	1.88	188	1.60	102	1.26	39	1.08	18	1.05	16	1.58	97	2.36	395	1.88	188
14,	2.40	415	2.25	340	2.49	464	2.61	536	1.84	174	1.56	93	1.36	54	1.05	16	1.03	14	1.51	81	2.28	355	1.88	188
15,	2.37	400	2.20	317	2.59	523	2.52	481	1.78	154	1.54	88	1.30	44	1.03	14	1.00	12	1.48	75	2.23	331	1.86	181
16,	2.32	374	2.15	295	2.74	626	2.49	464	1.73	138	1.53	86	1.18	29	1.01	13	1.00	12	1.46	71	2.33	379	1.84	174
17,	2.30	364	2.08	265	2.64	556	2.41	420	1.70	128	1.48	75	1.16	27	1.00	12	0.98	11	1.43	66	2.30	364	1.83	170
18,	2.26	345	2.04	249	2.55	499	2.34	384	1.68	123	1.48	75	1.13	23	1.60	102	1.05	16	1.40	60	2.28	355	1.81	164
19,	2.35	390	2.10	273	2.42	426	2.27	350	1.83	170	1.43	66	1.10	20	1.52	84	1.15	26	1.38	57	2.23	331	1.78	154
20,	2.25	340	2.02	241	2.57	511	2.23	331	1.73	138	1.38	57	1.08	18	1.35	52	1.12	22	1.58	97	2.16	299	1.76	147
21,	2.20	317	2.00	233	2.65	562	2.19	313	1.68	123	1.58	97	1.63	14	1.22	34	1.18	29	1.98	225	2.13	286	1.73	138
22,	2.18	308	2.10	273	2.59	523	2.17	304	1.66	118	1.54	88	1.16	27	1.18	29	2.00	233	1.93	206	2.08	265	1.70	128
23,	2.15	295	2.35	390	2.49	464	2.11	277	1.88	188	1.48	75	1.10	20	1.25	38	1.80	160	1.86	181	2.01	237	1.68	123
24,	2.26	345	2.23	331	2.41	420	2.07	261	2.46	447	1.43	66	1.20	31	1.22	34	1.60	102	1.76	147	1.98	225	2.23	331
25,	2.22	326	2.14	291	2.37	400	2.02	241	2.40	415	1.41	62	1.22	34	1.15	26	1.50	79	2.03	245	1.91	199	2.28	355
26,	2.16	299	2.10	273	2.45	442	1.99	229	2.28	355	1.40	60	1.18	29	1.10	20	1.40	60	2.38	405	1.88	188	2.22	326
27,	2.12	282	2.15	295	2.69	589	1.94	210	2.16	299	1.38	57	1.13	23	1.05	16	1.38	57	2.28	355	1.84	174	2.18	308
28,	2.10	273	2.40	415	3.69	1550	2.19	313	2.16	299	1.36	54	1.13	23	1.03	14	1.30	44	2.18	308	1.78	154	2.10	273
29,	2.03	245	......	......	3.21	1040	2.51	475	2.34	384	1.33	49	1.10	20	1.00	12	1.25	38	2.10	273	2.08	265	2.08	265
30,	2.10	273	......	......	2.89	742	2.49	464	2.18	308	1.30	44	1.08	18	1.15	26	1.20	31	1.98	225	2.03	245	*2.26	345
31,	2.05	253	......	......	2.69	589	....	......	2.13	286	....	......	1.10	20	1.18	29	....	......	1.92	203	....	......	2.28	355

*Slush ice on bottom. †Slush ice running.

ESTIMATED MONTHLY DISCHARGE OF BIG BUSHKILL CREEK, AT SHOEMAKERS, MONROE COUNTY, PA.

(Drainage area 115 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	750	245	415	3.609	4.161
February,	499	233	314	2.730	2.843
March,	1550	167	446	3.878	4.471
April,	664	210	397	3.452	3.851
May,	447	118	245	2.130	2.456
June,	265	44	112	0.974	1.086
July,	79	14	35	0.304	0.350
August,	110	12	33	0.287	0.331
September,	233	9	38	0.330	0.368
October,	405	54	151	1.313	1.514
November,	549	123	269	2.339	2.610
December,	355	123	217	1.887	2.175
The year,	1550	9	223	1.936	26.216

ANALOMINK CREEK.

DESCRIPTION OF BASIN.

Analomink creek, sometimes called Holler creek, and also known as West Branch of Brodheads creek, is a tributary of Brodheads creek in the central part of Monroe county, lying almost entirely within Paradise township and draining an area of approximately 45 square miles. This stream rises in three branches, Paradise, Holler and Swiftwater creeks, in the Pocono mountains, following from their junction a general southeasterly direction for approximately 10 miles to its mouth in Brodheads creek, one mile above Analomink. The watershed is sparsely inhabited, being covered with second growth timber except for small agricultural areas. The slope is generally steep, except at the junction of the three branches where the valley widens for a short distance, from which point it continues with a steep slope to its mouth. It lies entirely within the glacial area. One or two small water power plants are operated during the summer, and two water works systems obtain supplies from springs at the headwaters.

The mean annual precipitation over this watershed is from 45 to 50 inches.

The discharge has been measured since September 16, 1908, at Henryville, 2½ miles above the mouth.

DELAWARE BASIN—STATION NO. 8.

ANALOMINK CREEK AT HENRYVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, highway bridge, at Parkside, one mile from D. L. and W. Railroad Station at Henryville, Monroe county.

RECORDS AVAILABLE—Discharge complete from September 16 to December 31, 1911, and February 17 to December 31, 1913.

DRAINAGE AREA—35 square miles.

GAGE—An 8 foot staff gage is spiked to a pine tree on the right bank, about 500 feet above the bridge. The elevation of zero is arbitrary. Bench Mark No. 1 is a spike in root of a large walnut tree, just downstream from gage on right bank, 43 paces upstream from upstream end of laundry building, elevation 7.045 feet above gage datum. It is read twice daily by George C. Henry.

DISCHARGE MEASUREMENTS—Taken from the downstream side of bridge at high stages and by wading above bridge at normal and low stages. The initial point for soundings is right end of top angle of downstream handrail.

CHANNEL—The channel above and below the station is straight for 200 feet. The right and left banks are not subject to overflow, and the bed is of gravel. Ice conditions exist during some periods of the year.

DISCHARGE MEASUREMENTS OF ANALOMINK CREEK, AT HENRYVILLE, MONROE COUNTY, PA.

(Drainage area 35 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
10	1912 June 26	Langenheim, ...	20	14	1.67	0.57	23	Wading 100′ below bridge.
11	1913 July 29	Boehringer, ...	44	28	0.50	0.45	14	Wading below bridge.

DISCHARGE TABLE FOR ANALOMINK CREEK, AT HENRYVILLE, MONROE COUNTY, FROM SEPT. 16, 1908.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
0.30	8	1.00	119	.70	356	.40	650	.10	976
.40	12	.10	147	.80	395	.50	696	.20	1023
.50	20	.20	178	.90	436	.60	742	.30	1070
.60	32	.30	209	2.00	477	.70	789		
.70	48	.40	243	.10	519	.80	835		
.80	68	.50	280	.20	561	.90	882		
.90	92	.60	318	.30	605	3.00	929		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF ANALOMINK CREEK AT HENRYVILLE, MONROE COUNTY, PA.

1913.	FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	......	......	0.89	90	1.42	250	0.84	78	0.94	103	0.46	17	0.66	42	0.41	13	0.42	14	0.73	54	0.89	90
2, ...	......	......	0.90	92	1.29	206	0.99	116	0.94	103	0.52	22	0.76	60	0.40	12	0.42	14	0.73	54	0.89	90
3, ...	......	......	0.85	80	1.19	175	1.14	159	0.84	78	0.54	25	0.74	56	0.39	12	0.42	14	0.73	54	0.88	87
4, ...	......	......	0.83	75	1.09	144	1.09	144	0.84	78	0.54	25	0.68	45	0.38	11	0.42	14	0.71	50	0.87	85
5, ...	......	......	0.82	73	1.04	130	1.04	130	0.86	82	0.52	22	0.65	40	0.38	11	0.40	12	0.71	50	0.87	85
6, ...	......	......	0.86	82	1.04	130	1.04	130	0.82	73	0.53	24	0.65	40	0.37	11	0.40	12	0.70	48	0.83	75
7, ...	......	......	0.89	90	1.04	130	1.04	130	0.72	52	0.52	22	0.58	30	0.37	11	0.38	11	0.63	37	0.88	87
8, ...	......	......	1.04	130	0.99	116	1.04	130	0.76	60	0.52	22	0.44	15	0.37	1	0.40	12	0.62	35	1.13	156
9, ...	......	......	0.82	73	0.98	114	1.04	130	0.84	78	0.52	22	0.42	14	0.36	10	0.43	14	1.93	448	1.03	127
10, ...	......	......	0.69	46	0.96	108	0.94	130	0.76	60	0.53	24	0.39	12	0.36	0	0.44	15	1.43	254	0.93	100
11, ...	......	......	0.84	78	1.22	184	0.84	78	0.79	66	0.52	22	0.38	11	0.36	10	0.44	15	1.35	226	0.93	100
12, ...	......	......	0.82	73	1.34	223	0.84	78	0.84	78	0.52	22	0.38	11	0.37	11	0.44	15	1.03	127	0.91	95
13, ...	......	......	0.85	80	1.32	216	0.84	78	0.79	66	0.51	21	0.38	11	0.39	12	0.42	14	0.93	100	0.91	95
14, ...	......	......	2.54	714	1.26	197	0.84	78	0.72	52	0.51	21	0.37	11	0.38	1	0.42	14	0.92	97	0.88	87
15, ...	......	......	2.69	784	1.16	166	0.88	87	0.74	56	0.50	20	0.38	11	0.38	1	0.40	12	0.89	90	0.88	87
16, ...	......	......	1.69	352	1.14	159	0.88	87	0.66	42	0.51	21	0.36	10	0.38	1	0.40	12	0.90	92	0.87	85
17, ...	0.79	66	1.24	190	1.04	130	0.84	78	0.62	35	0.51	21	0.40	12	0.37	1	0.40	12	0.93	100	0.88	87
18, ...	0.78	64	1.09	144	1.02	125	0.84	78	0.52	22	0.51	21	0.41	13	0.36	1	0.40	12	0.93	100	0.83	75
19, ...	0.78	64	0.99	116	0.94	103	0.83	75	0.54	25	0.50	20	0.39	12	0.36	1	0.42	14	0.90	92	0.83	75
20, ...	0.80	68	1.34	223	0.94	103	0.84	78	0.54	25	0.49	19	0.39	12	0.36	1	1.26	197	0.89	90	0.83	75
21, ...	0.79	66	1.09	144	0.94	103	0.84	78	0.56	27	0.49	19	0.39	12	0.49	1	1.06	136	0.89	90	0.83	75
22, ...	0.94	103	1.04	130	0.94	103	0.84	78	0.54	25	0.48	18	0.36	10	0.76	6	0.93	100	0.89	90	0.80	68
23, ...	0.94	103	1.14	159	0.89	90	0.84	78	0.52	22	0.50	20	0.38	11	0.72	5	0.84	78	0.89	90	0.79	66
24, ...	0.95	106	0.99	116	0.92	97	0.84	78	0.44	15	0.54	25	0.38	11	0.73	5	0.84	78	0.89	90	0.79	66
25, ...	0.94	103	0.99	116	0.82	73	0.84	78	0.52	22	0.54	25	0.38	11	0.66	4	1.16	166	0.85	80	0.85	80
26, ...	0.92	97	1.52	288	0.76	60	0.84	78	0.49	19	0.49	19	0.39	12	0.51	2	1.17	169	0.89	90	0.93	100
27, ...	0.93	100	*2.94	901	0.82	73	0.86	82	0.54	25	0.48	18	0.39	12	0.44	1	0.94	103	0.88	87	0.91	95
28, ...	0.92	97	2.24	579	1.69	352	0.89	90	0.54	25	0.46	17	0.38	11	0.45	1	0.85	80	0.89	90	0.89	90
29, ...	......	......	1.84	411	1.44	258	1.04	130	0.44	15	0.44	15	0.40	12	0.42	1	0.86	82	0.89	90	0.85	80
30, ...	......	......	1.29	206	1.34	223	1.00	119	0.44	15	0.44	15	0.44	15	0.42	1	0.81	70	0.89	90	0.83	75
31, ...	......	......	1.29	206	......	......	0.94	103	......	......	0.44	15	0.42	14	....	.....	0.80	68	......	......	0.83	75

*Max. 3.34′ at 5 p. m. 1090 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF ANALOMINK CREEK, AT HENRYVILLE, MONROE COUNTY, PA.

(Drainage area 35 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
March,	1090	46	221	6.314	7.279
April,	352	60	151	4.314	4.813
May,	159	75	98	2.800	3.228
June,	103	15	48	1.371	1.530
July,	[illegible]	[illegible]	21	0.600	0.692
August,	60	10	19	0.543	0.626
September,	60	10	18	0.514	0.573
October,	197	11	51	1.457	1.680
November,	448	35	103	2.943	3.283
December,	156	66	88	2.514	2.898

BRODHEADS CREEK.

DESCRIPTION OF BASIN.

Brodheads creek, a tributary of the Delaware river in the central part of Monroe county, and one of the largest streams therein, drains approximately 285 square miles. Rising in the Pocono mountains, in the northwestern corner of Barrett township, it follows a southerly course through a sparsely inhabited area covered with second growth timber at its headwaters, thence through an agricultural region, to its mouth one mile above Delaware Water Gap, its total length being approximately 28 miles. Its source is at an elevation of about 2,000 feet above sea level, and its mouth 290 feet. The principal tributaries are Analomink, or Holler creek, McMichaels and Marshall creeks, the watershed including numerous small lakes, ponds and swamps, the stream lying entirely within the glacial area, while on it and its tributaries are numerous falls and rapids. The main stream is rapid, flowing over a rocky bed, between usually steep banks, and is generally in a narrow valley except near the headwaters where the valleys widen and the slopes are more gradual. In this drainage basin lie the principal boroughs and villages of the county, several of which obtain water supplies from the creek or its tributaries. Brodheads creek and its affluents are used to some extent for power purposes, while available sites are as yet undeveloped.

The mean annual precipitation over this watershed is from 45 to 50 inches.

The discharge of this stream has been measured since September 17th, 1908, at Analomink, 9 miles above the mouth.

Gaging Station on Brodheads Creek, at Analomink.

DELAWARE BASIN—STATION NO. 9.

BRODHEADS CREEK AT ANALOMINK, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, ¼ mile above Analomink station, Monroe county.

RECORDS AVAILABLE—Discharge measurements and gage heights from September 17, 1908, to October 13, 1913.

DRAINAGE AREA—120 square miles.

GAGE—A 14 ft. staff gage is bolted to the downstream face of the left abutment. The elevation of zero is arbitrary. Bench Mark No. 1 is on top of reddish stone in left abutment, bottom course, outer downstream corner, elevation 2.11 ft. above gage datum. The gage was read twice daily by W. F. Persbacker.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is end of top angle of downstream handrail at left bank, designated as station—2.3 ft. During low stages wading measurements are obtained at a riffle above the bridge.

CHANNEL—The channel above the station is straight for 100 ft., and below the station for 300 feet. The right bank overflows through a concrete arch for roadway under D. L. & W. railroad tracks at highest stages. The left bank does not overflow. The bed is mostly solid rock.

REMARKS—There is a wooden dam about 1,000 feet downstream which did not, however, back water up to the gage until July, 1913, when the dam was raised about one foot causing backwater on the gage and, for this reason, the station was discontinued.

DISCHARGE MEASUREMENTS OF BRODHEADS CREEK, AT ANALOMINK, MONROE COUNTY, PA.

(Drainage area 120 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
10	July 29	Boehringer	69	147	0.16	1.73	24	Wading msmt. above R. R. bridge.

DAILY MEAN GAGE HEIGHTS OF BRODHEADS CREEK AT ANALOMINK, MONROE COUNTY, PA.

1913.	JAN.	FEB.	MARCH.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	2.35	2.10	2.10	2.95	2.72	1.70	0.94	1.92	1.48	1.84
2,	2.05	1.85	1.85	2.80	2.69	1.68	0.97	2.44	1.48	2.02
3,	3.45	1.75	1.78	2.49	2.64	1.64	1.00	2.18	1.51	2.06
4,	3.20	1.70	1.74	2.38	2.48	1.60	1.02	1.88	1.56	2.02
5,	2.80	1.58	1.70	2.25	2.44	1.54	1.14	1.82	1.56	1.99
6,	2.55	1.50	1.68	2.12	2.38	1.48	1.32	1.70	1.57	1.93
7,	2.52	*2.60	1.65	1.95	2.30	1.44	1.39	1.66	1.58	1.91
8,	3.30	2.20	1.63	1.89	2.23	1.39	1.39	1.66	1.58	1.91
9,	3.30	2.22	1.60	1.60	2.16	1.36	1.37	1.64	1.58	1.92
10,	2.98	2.08	1.45	1.40	2.03	1.33	1.35	1.58	1.60	1.94
11,	2.95	1.95	1.70	2.30	1.98	1.30	1.34	1.60	1.60	2.02
12,	3.08	1.75	1.82	2.70	1.87	1.23	1.34	1.53	1.60	2.04
13,	3.05	1.70	2.50	2.95	1.75	1.19	1.35	1.54	1.58	1.95
14,	2.75	1.78	4.20	2.78	1.67	1.14	1.34	1.56	1.58	....
15,	2.58	1.82	3.85	2.58	1.56	1.09	1.34	1.56	1.58	....
16,	2.40	1.82	2.95	2.48	1.50	1.08	1.33	1.54	1.58	....
17,	2.60	1.80	2.82	2.42	1.48	1.06	1.34	1.52	1.60	....
18,	2.45	1.80	2.65	2.25	1.48	1.06	1.34	1.50	1.78	....
19,	2.25	1.65	2.42	2.18	1.47	1.05	1.35	1.48	1.80	....
20,	2.15	†1.40	3.20	2.00	1.46	1.04	1.36	1.46	1.86	....
21,	2.08	1.20	3.55	1.96	1.46	1.02	1.35	1.45	2.52	....
22,	1.99	1.42	2.95	1.90	1.44	0.99	1.37	1.46	2.50	....
23,	2.25	2.00	2.60	1.86	1.46	0.96	1.36	1.44	2.47	....
24,	2.49	1.82	3.25	1.84	1.62	0.95	1.35	1.42	2.35	....
25,	2.18	1.65	3.75	1.76	1.80	0.92	1.35	1.46	2.08	....
26,	1.98	1.45	5.25	1.76	1.78	0.86	1.36	1.48	1.90	....
27,	2.30	1.52	7.00	1.70	1.76	0.82	1.36	1.49	1.88	....
28,	2.45	2.45	4.75	2.80	1.74	0.80	1.37	1.46	1.88	....
29,	2.22	....	4.35	3.20	1.72	0.80	1.35	1.46	1.77	....
30,	1.95	....	3.15	2.82	1.72	0.82	1.38	1.48	1.76	....
31,	2.02	....	3.02	....	‡1.71	....	1.39	1.48	....	....

*Creek frozen Feb. 7-19. †Ice went out. ‡Interpolated.

POCONO CREEK.

DESCRIPTION OF BASIN.

Pocono creek, the largest tributary of McMichaels creek, lies in the south central part of Monroe county, draining an area of approximately 42 square miles. It rises in the Pocono mountains in the central part of the county, flowing in a general southerly direction through an uninhabited area covered with second growth timber, to a point about six miles west of Stroudsburg, where it turns to an easterly direction through a farming section to its mouth in the center of the town, a total distance of approximately 12 miles. In its upper sections the slope of the stream is steep, while in the lower section it is much flatter, and it lies entirely within the glacial area. A few grist mills, operated by water power, exist on the lower sections of this creek.

The mean annual precipitation over this watershed is from 45 to 50 inches.

The flow has been measured since August 3, 1911, at the Spoke Factory bridge, near Stroudsburg, 2 miles above the mouth.

DELAWARE BASIN—STATION NO. 10.

POCONO CREEK NEAR STROUDSBURG, PA.

DESCRIPTION OF STATION.

LOCATION—On covered wooden bridge about 2 miles above Stroudsburg, Monroe county, near spoke factory.

RECORDS AVAILABLE—Discharge complete from August 10, 1911, to December 31, 1913.

DRAINAGE AREA—38 square miles.

GAGE—A sectional chain gage is fastened to the upstream guard-rail near the left bank. The elevation of zero is arbitrary. The length of chain from bottom of weight to marker is 13.99 feet. Bench Mark No. 1 is a large staple on the inside of the right upstream one of a pair of angling wooden braces, elevation 15.73 feet above gage datum. Bench Mark No. 2 is top of flat stone on top of face of left abutment, near upstream corner, below angle between upstream side of wooden bridge and end of wingwall guard wall, about 10 inches from side of bridge, elevation 10.67 feet above gage datum. The gage is read twice daily by George Brands.

DISCHARGE MEASUREMENTS—Taken from the downstream side of bridge during high stages, and by wading below the bridge during medium and low stages. The initial point for soundings is face of downstream abutment, right end looking downstream.

CHANNEL—The channel above the station makes a gentle curve to the right for 600 feet, while below the station it is straight for 450 feet. The banks are high and not subject to overflow. The bed is of small stone and gravel.

REMARKS—This station is maintained through co-operation with Meikleham and Dinsmore, Engineers, New York City.

DISCHARGE MEASUREMENTS OF POCONO CREEK, NEAR STROUDSBURG, MONROE COUNTY, PA.

(Drainage area 38 square miles.)

No	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
6	July 28	Boehringer, ...	19	16	0.81	1.95	13	Wading msmt. 100′ below bridge.
7	Sept. 29	Reckord, ...	20	20	0.90	2.12	18	Wading msmt. 75′ below bridge.

DISCHARGE TABLE FOR POCONO CREEK, NEAR STROUDSBURG, MONROE COUNTY, FROM AUG. 10, 1911.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.80	9	.50	47	.20	137	.90	310	.60	607
.90	12	.60	57	.30	156	4.00	344	.70	660
2.00	15	.70	68	.40	177	.10	380	.80	716
.10	19	.80	80	.50	199	.20	420	.90	776
.20	24	.90	92	.60	223	.30	462	5.60	845
.30	30	3.00	106	.70	249	.40	507	.10	920
.40	38	.10	121	.80	278	.50	556	.20	1005

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF POCONO CREEK NEAR STROUDSBURG, MONROE COUNTY, PA.

1911.	AUGUST.		SEPT.		OCTOBER.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	......	......	3.74	261	2.45	42	2.82	82	2.82	82
2,	......	......	3.36	169	2.99	104	2.70	68	2.82	82
3,	......	......	3.20	137	2.78	78	2.75	74	2.70	68
4,	......	......	2.73	72	2.42	40	2.65	62	2.78	78
5,	......	......	2.76	75	2.50	47	2.65	62	2.82	82
6,	......	......	3.55	211	2.45	42	2.60	57	2.80	80
7,	......	......	2.75	74	2.65	62	3.00	106	2.72	70
8,	......	......	2.80	80	2.55	52	2.78	78	2.72	70
9,	......	......	2.80	80	2.50	47	2.68	66	2.72	70
10,	2.12	20	2.70	68	2.50	47	2.72	70	2.72	70
11,	2.12	20	2.69	67	2.60	57	2.60	57	2.72	70
12,	2.15	22	2.64	61	2.60	57	2.60	57	2.76	75
13,	2.15	22	2.55	52	2.38	36	2.88	90	2.74	73
14,	2.00	15	2.42	40	2.40	38	2.70	68	2.72	70
15,	2.05	17	2.40	38	2.35	34	2.75	74	2.88	90
16,	2.05	17	2.50	47	2.42	40	2.68	66	3.20	137
17,	1.92	13	2.40	38	2.35	34	2.72	70	3.20	137
18,	1.88	11	2.30	30	2.88	90	3.32	160	3.00	106
19,	2.15	22	2.28	29	3.42	181	3.22	141	2.95	99
20,	2.05	17	2.31	31	3.45	188	3.20	137	2.90	92
21,	2.00	15	2.39	37	3.62	228	3.00	106	2.96	100
22,	2.05	17	2.31	31	2.65	62	3.02	109	3.08	118
23,	2.00	15	2.28	29	†4.16	404	2.90	92	3.26	148
24,	2.05	17	2.22	25	3.85	294	2.95	99	3.24	145
25,	2.05	17	2.24	26	3.60	223	2.92	95	3.00	106
26,	2.15	22	2.22	25	3.50	199	2.88	90	2.95	99
27,	2.05	17	2.23	26	3.35	166	2.88	90	3.30	156
28,	2.10	19	2.27	28	3.30	156	2.92	95	2.98	103
29,	2.10	19	2.35	34	3.18	134	3.10	121	2.96	100
30,	3.25	146	2.45	42	3.22	141	2.95	99	2.95	99
31,	*4.32	471	......	......	2.91	93	......	......	2.98	103

*Max. 4.50 at 4 p. m.; 556 sec. ft. †Max. 4.42 at 11 a. m.; 517 sec. ft.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF POCONO CREEK NEAR STROUDSBURG, MONROE COUNTY, PA.

1912.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	2.98	103	2.50	47	3.38	173	3.89	307	3.35	166	2.50	47	2.48	45	1.78	8	2.07	18	2.47	44	2.79	79	2.58	55
2, ...	2.92	95	2.48	45	3.31	158	3.94	324	3.33	162	2.42	40	2.06	17	1.80	9	2.25	27	2.41	39	2.92	95	2.78	78
3, ...	2.94	98	2.51	48	3.21	139	4.04	358	3.24	145	2.48	45	2.10	19	2.06	17	2.17	22	2.39	37	2.73	72	3.38	173
4, ...	2.94	98	2.49	46	2.95	99	3.91	313	3.04	112	2.44	42	2.04	17	1.88	11	2.12	20	2.31	31	2.74	73	3.12	124
5, ...	2.93	96	2.44	42	2.89	91	3.78	272	3.06	115	2.49	46	1.98	14	1.78	8	2.17	22	2.27	28	2.69	67	f2.98	103
6, ...	2.94	98	2.40	38	2.75	74	3.57	216	3.05	114	2.44	42	2.06	17	1.83	10	2.12	20	2.32	32	2.62	59	......	....
7, ...	2.94	98	2.39	37	b2.81	81	3.39	175	3.14	127	2.37	36	1.95	14	1.86	11	2.09	19	2.25	27	3.05	114	......	....
8, ...	2.92	95	2.37	36	2.81	81	3.43	184	4.04	358	2.36	35	1.99	15	1.88	11	2.02	16	2.27	28	3.48	195	......	....
9, ...	2.91	98	2.34	33	2.91	93	3.45	188	3.74	261	2.29	29	1.98	14	1.88	11	2.12	20	2.15	22	3.19	135	......	....
10, ...	2.94	98	2.42	40	2.81	81	3.17	132	3.57	216	2.30	30	2.05	17	2.10	19	2.10	19	2.22	25	3.07	116	......	....
11, ...	2.90	92	2.34	33	2.85	86	3.11	123	3.40	177	2.36	35	2.03	16	2.80	80	2.03	16	2.42	40	3.01	107	g2.86	87
12, ...	2.72	70	2.35	34	2.82	82	3.05	114	3.39	175	2.29	29	2.01	17	2.50	47	2.05	17	2.32	32	2.95	99	2.77	76
13, ...	2.58	55	2.41	39	4.93	797	2.98	103	3.40	177	2.28	29	2.09	19	2.28	29	2.09	19	2.32	32	2.86	87	2.81	81
14, ...	2.55	52	2.40	38	4.51	561	2.98	103	3.35	166	2.18	23	2.26	28	2.15	22	1.99	15	2.31	31	2.94	98	2.78	78
15, ...	2.55	52	2.42	40	c5.49	m1310	2.98	103	3.25	146	2.24	26	2.15	22	2.08	18	1.95	14	2.26	28	2.77	76	2.70	68
16, ...	2.56	53	2.43	41	5.44	m1250	2.99	105	d3.79	275	2.28	29	2.16	22	2.06	17	2.35	34	2.33	32	2.65	62	2.72	70
17, ...	2.55	52	2.44	42	4.41	512	3.00	106	4.04	358	2.29	29	2.33	32	2.20	24	2.15	22	2.25	27	2.66	64	2.64	61
18, ...	2.56	53	2.42	40	4.29	458	3.98	337	3.80	278	2.26	28	2.24	26	2.38	36	2.07	18	2.27	28	2.69	67	2.58	55
19, ...	2.98	103	2.45	42	4.04	358	3.84	291	3.59	221	2.18	23	2.20	24	2.23	26	2.19	24	2.21	25	2.61	58	3.41	179
20, ...	3.05	114	2.62	59	4.03	355	3.65	236	3.43	184	2.19	24	2.10	19	2.33	32	2.16	22	2.17	22	2.58	55	2.91	93
21, ...	2.98	103	2.72	70	3.98	337	3.41	179	3.24	145	2.14	21	2.10	19	2.36	35	2.13	20	2.23	26	2.56	53	2.76	75
22, ...	2.94	98	a4.78	705	3.81	281	3.35	166	3.08	118	2.20	24	2.18	23	2.40	38	2.15	22	e3.16	131	2.58	55	2.78	78
23, ...	2.90	92	3.90	310	3.71	252	3.27	150	3.11	123	2.17	22	2.14	21	2.29	29	2.17	22	3.51	201	2.57	54	2.71	69
24, ...	2.92	95	3.12	124	3.74	261	3.19	135	3.08	118	2.19	24	2.02	16	2.17	22	2.37	36	3.46	190	3.17	132	2.66	64
25, ...	2.90	92	3.24	145	3.89	307	3.18	134	3.01	108	2.14	21	2.03	16	2.13	20	3.37	171	3.29	154	2.89	91	f2.78	78
26, ...	2.90	92	3.40	177	3.75	264	3.11	123	2.91	93	2.18	23	2.02	16	2.13	20	2.89	91	3.05	114	2.93	96	......	....
27, ...	2.82	82	4.26	445	3.61	226	3.18	134	2.78	78	2.13	20	1.96	14	2.14	21	2.67	65	2.97	102	2.79	79	......	....
28, ...	2.76	75	3.78	272	3.78	272	3.17	132	2.71	69	2.10	19	1.88	11	2.06	17	2.59	56	2.95	99	2.79	79	......	....
29, ...	2.70	68	3.42	181	4.50	556	3.29	154	2.64	61	2.14	21	1.91	12	2.08	18	2.55	52	2.79	79	2.77	76	......	....
30, ...	2.59	56	......	......	4.35	484	3.45	188	2.75	74	2.48	45	1.95	14	2.10	19	2.45	42	2.67	65	2.65	62	......	....
31, ...	2.53	50	......	......	4.04	358	....	......	2.59	56	....	......	1.90	12	2.16	22	....	......	2.69	67	....	......	......	....

Note.—a maximum 4.82 at 8:30 p. m.; 728 sec. ft. b channel open. c maximum 5.99 at 4:35 p. m.; m 1850 sec. ft. d max. 4.34 at 4:15 p. m.: 480 sec. ft. e Max. —3.97 at 4:15 p. m.; 334 sec. ft. f Gage stolen during p. m. g Gage re-established. m estimated.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF POCONO CREEK NEAR STROUDSBURG, MONROE COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	*	......	2.79	79	2.96	100	3.57	216	3.55	211	2.66	64	2.15	22	c2.97	102	1.90	12	2.23	26	2.57	54	2.78	78
2, ...	*	......	2.72	70	2.88	90	3.59	221	3.43	184	2.56	53	2.17	22	2.44	42	1.88	11	2.58	55	2.51	48	2.68	66
3, ...	*	......	2.72	70	2.98	103	3.39	175	3.40	177	2.53	50	2.08	18	2.27	28	1.94	13	2.20	24	2.65	62	2.68	66
4, ...	*	......	2.67	65	2.90	92	3.19	135	3.19	135	2.46	43	1.98	14	2.11	20	1.87	11	2.22	25	2.61	58	2.68	66
5, ...	*	......	2.67	65	2.78	78	3.23	143	3.10	121	2.42	40	2.01	15	2.09	19	1.96	14	2.30	36	2.52	49	2.58	55
6, ...	*	......	2.62	59	2.66	64	3.02	109	3.00	106	2.42	40	1.98	14	2.09	19	1.97	14	2.22	25	2.56	53	2.63	60
7, ...	3.45	188	2.44	42	2.73	72	2.89	91	2.95	99	2.32	32	2.04	17	2.09	19	1.90	12	2.67	65	2.53	50	2.68	66
8, ...	4.07	369	2.69	67	2.76	75	2.96	100	2.90	92	2.35	31	1.99	15	2.15	22	1.98	14	2.34	33	3.17	132	2.73	72
9, ...	4.25	441	2.67	65	2.63	60	2.95	99	2.85	86	2.49	46	2.13	20	1.97	14	2.00	15	2.38	36	d6.01	m1860	2.76	75
10, ...	3.55	211	2.77	76	2.58	55	2.82	82	2.80	80	2.36	35	2.23	26	2.09	19	1.97	14	2.39	37	5.74	m1580	2.62	59
11, ...	3.62	228	2.63	60	2.86	87	2.95	99	2.75	74	2.32	32	2.16	22	2.07	18	1.96	14	2.50	47	5.24	m1040	2.65	62
12, ...	3.82	284	2.61	58	2.78	78	3.91	313	2.77	76	2.34	33	2.16	22	2.05	17	1.96	14	2.60	57	4.09	376	2.62	59
13, ...	3.49	197	2.53	50	2.73	72	3.92	317	2.71	69	2.34	33	2.23	26	2.04	17	2.03	16	2.43	41	3.41	179	2.67	65
14, ...	3.26	148	2.71	69	4.68	649	3.72	255	2.67	65	2.26	28	2.25	27	2.08	18	1.93	13	2.40	38	2.91	93	2.68	66
15, ...	3.22	141	2.56	53	4.58	597	3.65	236	2.55	52	2.28	29	2.21	25	1.93	13	1.94	13	2.43	41	2.81	81	2.70	68
16, ...	3.14	127	2.71	69	3.68	244	3.67	241	2.63	60	2.36	35	2.09	19	1.83	10	2.05	17	2.41	39	2.91	93	2.76	75
17, ...	3.24	145	2.76	75	3.78	272	3.49	197	2.64	61	2.38	36	2.04	17	1.91	12	1.90	12	2.30	30	3.19	135	2.66	64
18, ...	3.22	141	2.69	67	3.56	213	3.55	211	2.51	48	2.26	28	2.15	22	2.09	19	2.02	16	2.34	33	2.97	102	2.68	66
19, ...	3.29	154	2.59	56	3.39	175	3.25	146	2.52	49	2.23	26	1.94	13	2.31	31	2.06	17	2.33	32	3.01	108	2.67	65
20, ...	3.04	112	2.47	44	4.05	362	3.15	129	2.55	52	2.26	28	1.93	13	2.05	17	2.08	18	3.40	177	2.95	99	2.46	43
21.	3.05	114	2.57	54	3.60	223	3.02	109	2.53	50	2.36	35	1.89	12	2.03	16	2.16	22	3.86	297	2.91	93	2.45	42
22, ...	2.93	96	2.84	85	3.46	190	2.94	98	2.47	44	2.22	25	1.88	11	2.07	18	2.80	80	2.78	78	2.89	91	2.64	61
23, ...	3.01	108	2.87	88	3.40	177	2.95	99	2.67	65	2.20	24	1.98	14	2.21	25	2.18	23	2.73	72	2.85	86	2.49	46
24, ...	3.08	118	2.77	76	3.26	148	2.97	102	3.53	206	2.19	24	2.23	26	1.99	15	1.90	12	2.60	57	2.77	76	3.32	160
25, ...	2.98	103	2.51	48	3.36	169	2.89	91	3.10	121	2.23	26	2.18	23	1.97	14	2.04	17	3.62	228	2.60	57	3.24	145
26, ...	2.93	96	2.41	39	3.78	272	2.85	86	2.93	96	2.19	24	2.01	15	2.17	22	2.00	15	3.57	216	2.55	52	3.00	106
27, ...	2.93	96	2.50	47	b5.73	m1570	2.72	70	2.87	88	2.18	23	2.25	27	2.09	19	2.08	18	3.20	137	2.50	47	2.99	105
28, ...	2.91	93	3.17	132	5.15	962	4.42	517	2.95	99	2.16	22	1.95	14	1.99	15	1.96	14	2.98	103	2.65	62	2.96	100
29, ...	2.83	84	....	......	4.20	420	4.12	388	2.97	102	2.19	24	1.94	13	2.14	21	2.14	21	2.96	100	2.79	79	2.92	95
30, ...	2.83	84	....	......	3.98	337	3.87	300	2.77	76	2.22	25	2.04	17	2.29	29	2.14	21	2.82	82	2.87	88	2.88	90
31, ...	2.80	80	....	......	3.96	330	....	......	2.70	68	....	......	1.88	11	1.97	14	....	......	2.76	75	......	......	2.82	82

Notes.—*Chain stolen. bMax. 6.48 at 4:10 p. m.; m2400 sec. ft. cMax. 3.84 at 4:50 p. m.; 291 sec. ft. dMax. 6.22′ at 8:40 a. m.; m2080 sec. ft.
mEstimated.

ESTIMATED MONTHLY DISCHARGE OF POCONO CREEK, NEAR STROUDSBURG, MONROE COUNTY, PA.

(Drainage area 38 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1911.					
September,	261	25	65	1.711	1.909
October,	517	34	110	2.895	3.338
November,	160	57	88	2.316	2.584
December,	156	68	96	2.526	2.912

MONTH.	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1912.					
January,	114	50	83	2.184	2.518
February,	728	33	112	2.947	3.179
March,	m1850	74	337	8.868	10.224
April,	358	103	186	4.895	5.462
May,	480	56	161	4,237	4.885
June,	47	19	30	0.789	0.880
July,	45	11	19	0.500	0,576
August,	80	8	23	0.605	0.698
September,	171	14	33	0.868	0.969
October,	334	22	59	1.553	1.791
November,	195	53	85	2.237	2.496

Note.—Gage out during part of December. m Estimated.

MONTH.	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
February,	132	39	65	1.711	1.782
March,	m2400	55	269	7.079	8.161
April,	517	70	179	4.711	5.256
May,	211	44	94	2.474	2.852
June,	64	22	33	0.868	0.969
July,	27	11	18	0.474	0.546
August,	291	10	22	0.579	0.668
September,	80	11	17	0.447	0.499
October,	297	24	76	2.000	2.306
November,	m2080	47	233	6.132	6.841
December,	160	42	75	1.974	2.276

Note.—Gage out during part of January. m Estimated.

McMICHAELS CREEK.

DESCRIPTION OF BASIN.

McMichaels creek, the largest tributary of Brodheads creek, lies in the south central part of Monroe county, draining an area of approximately 105 square miles. It rises in the Pocono mountains, flows first in a southerly direction through an uninhabited area covered with second growth, and thence turns easterly through a sparsely inhabited agricultural region, to its mouth a short distance below Stroudsburg, a distance of approximately 20 miles. In its upper section the slope of the creek is steep, while in the lower section it is much flatter, and it lies entirely within the glacial area. Pocono creek, with a drainage area of approximately 42 square miles, is the largest tributary, while several lakes and ponds lie within its watershed. A few grist mills, operated by water power, exist in the lower section of the creek and its tributaries.

The mean annual precipitation over this watershed is from 45 to 50 inches.

The flow has been measured at two points, namely, at the 7th Street Viaduct, Stroudsburg, from September 16, 1908, to July 16, 1910, at which time the station was discontinued, and at the railroad bridge near the car shops above Stroudsburg since August 3, 1911. The first station was a short distance below the mouth of Pocono creek, whereas the present station is about one mile above the mouth of Pocono creek.

DELAWARE BASIN—STATION NO. 11.

McMICHAELS CREEK AT CAR SHOPS ABOVE STROUDSBURG, PA.

DESCRIPTION OF STATION.

LOCATION—On railroad bridge of Wilkes-Barre and Eastern Railroad, near car shops above Stroudsburg, Monroe county.

RECORDS AVAILABLE—Discharge complete from August 10, 1911, to December 31, 1913.

DRAINAGE AREA—60 square miles.

GAGE—A sectional chain gage is fastened on the second panel from the left downstream side of bridge. The elevation of zero is arbitrary. The length of chain from bottom of weight to marker is 23.02 feet. Bench Mark No. 1 is cut on top of extreme upstream stone in upstream wingwall of right abutment, on top of 4th stone down from bridge seat, and is on the extreme upper outer corner, elevation 13.56 feet above gage datum. The gage is read twice daily by A. W. Marvin.

DISCHARGE MEASUREMENTS—Taken from the downstream side of bridge, or by wading below the bridge at low stages. The initial point for soundings is face of left abutment, downstream side.

CHANNEL—The channel above and below the station is straight for 100 and 50 yards respectively, but passes under the bridge at an angle of 39 degrees. Both banks are high and not subject to overflow. The bed consists of stones and mud.

REMARKS—This station is maintained through co-operation with Meikleham and Dinsmore, Engineers, New York City.

DISCHARGE MEASUREMENTS OF McMICHAELS CREEK, AT CAR SHOPS, ABOVE STROUDSBURG, MONROE COUNTY, PA.

(Drainage area 60 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
6	July 29	Boehringer, ...	65	53	0.43	2.89	23	Wading msmt. 1-3 mile below gage.
7	Sept. 29	Reckord, ...	65	60	0.67	3.00	40	Wading msmt. 1-3 mile below gage.

DISCHARGE TABLE FOR McMICHAELS CREEK, AT CAR SHOPS, ABOVE STROUDSBURG, MONROE COUNTY, FROM AUG. 10, 1911.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
2.80	18	.40	100	4.00	258	.60	492	.20	850
.90	28	.50	120	.10	292	.70	540	.30	928
3.00	40	.60	142	.20	326	.80	592	.40	1010
.10	52	.70	166	.30	364	.90	648	.50	1100
.20	66	.80	194	.40	404	5.00	710		
.30	82	.90	224	.50	446	.10	778		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF McMICHAELS CREEK AT CAR SHOPS ABOVE STROUDSBURG, MONROE COUNTY, PA.

1911.	AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	......	......	4.61	497	3.36	93	3.69	164	3.61	144
2,	......	......	4.24	341	4.06	278	3.61	144	3.60	142
3,	......	......	3.88	218	3.68	161	3.55	131	3.56	133
4,	......	......	3.72	172	3.59	140	3.53	127	3.62	147
5,	......	......	3.64	152	3.53	127	3.50	120	3.58	138
6,	......	......	4.12	299	3.40	100	3.50	120	3.58	138
7,	......	.....	3.62	147	3.62	147	3.84	206	*3.56	133
8,	......	......	3.56	133	3.40	100	3.56	133	*3.56	133
9,	......	......	3.55	131	3.34	89	3.53	127	*3.54	129
10,	3.18	63	3.52	124	3.32	86	3.50	120	3.54	129
11,	3.14	58	3.48	116	3.39	98	3.46	112	3.46	112
12,	3.08	50	3.48	116	3.35	91	3.47	114	3.44	108
13,	3.09	51	3.41	102	3.32	86	3.61	144	3.44	108
14,	3.12	55	3.35	91	3.30	82	3.45	110	3.38	96
15,	3.08	50	3.36	93	3.32	86	3.52	124	3.62	147
16,	3.08	50	3.42	104	3.35	91	3.56	133	3.94	238
17,	3.06	47	3.37	95	3.27	77	3.48	116	3.80	194
18,	3.07	48	3.30	82	b4.81	598	c4.42	412	3.72	172
19,	3.12	55	3.29	80	4.22	334	3.99	255	3.68	161
20,	3.04	45	3.28	79	4.08	285	3.92	231	3.65	154
21,	3.03	44	3.22	69	4.30	364	3.88	218	3.62	147
22,	3.02	42	3.40	100	4.16	312	3.80	194	3.72	172
23,	3.00	40	3.39	98	4.87	631	3.64	152	4.41	408
24,	3.03	44	3.34	89	4.47	433	3.88	218	3.84	206
25,	3.14	58	3.26	76	4.26	349	3.76	183	3.76	183
26,	3.17	62	3.24	72	4.10	292	3.64	152	3.77	186
27,	3.22	69	3.19	65	3.99	255	3.61	144	4.17	316
28,	3.17	62	3.18	63	3.88	218	3.60	142	3.80	194
29,	4.60	492	3.51	122	3.78	188	3.86	212	3.92	231
30,	4.08	285	3.38	96	3.75	180	3.64	152	3.71	169
31,	a5.26	897	......	......	3.70	166	......	......	3.75	180

Notes.—*Interpolated. mEstimated. aMax. 5.61′ at 4:24 p. m.; m1200 sec. ft. bMax. 5.56′ at 4:40 p. m.; m 1160 sec. ft. c max. 4.6′ at 4:38 p. m.; 492 sec. ft.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF McMICHAELS CREEK AT CAR SHOPS ABOVE STROUDSBURG, MONROE COUNTY, PA.

1912.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.68	161	3.35	91	3.85	209	......	......	3.85	209	3.38	96	3.06	47	3.01	41	3.00	40	3.39	98	3.58	138	3.48	116
2,	3.65	154	3.31	84	3.87	215	......	......	3.78	188	3.33	87	3.03	44	3.00	40	3.11	53	3.34	89	3.64	152	3.63	149
3,	3.56	133	3.27	77	3.84	206	*4.33	376	3.67	159	3.44	108	2.99	39	3.03	44	3.08	50	3.33	87	3.56	133	3.92	231
4,	3.55	131	3.20	66	3.74	177	4.14	306	3.66	156	3.39	98	2.98	38	3.00	40	3.04	45	3.30	82	3.52	124	3.84	206
5,	3.56	133	3.13	56	3.58	138	4.09	289	3.69	164	3.35	91	3.00	40	3.00	40	3.00	40	3.29	80	3.46	112	3.74	177
6,	3.61	144	3.15	59	3.84	206	4.00	258	3.76	183	3.40	100	3.03	44	2.98	38	3.16	60	3.26	76	3.40	100	4.08	285
7,	3.54	129	3.21	68	3.55	131	3.98	251	3.74	177	3.36	93	3.03	44	2.97	36	3.08	50	3.25	74	3.56	133	3.99	255
8,	3.46	112	3.21	68	2.51	122	4.05	275	4.55	469	3.30	82	3.02	42	2.97	36	3.06	47	3.24	72	4.08	285	3.84	206
9,	3.48	116	3.24	72	3.65	154	3.92	231	4.24	341	3.27	77	3.00	40	3.01	41	3.05	46	3.22	69	3.75	180	3.81	197
10,	3.48	116	3.30	82	3.55	131	3.80	194	4.00	258	3.24	72	3.01	41	3.05	46	3.04	45	3.20	66	3.73	174	3.68	161
11,	3.51	122	3.31	84	3.48	116	3.74	177	3.89	221	3.23	71	3.00	40	3.88	218	3.03	44	3.41	102	3.69	164	3.63	149
12,	3.54	129	3.32	86	3.48	116	3.70	166	3.85	209	3.21	68	3.01	41	3.42	104	3.02	42	3.36	93	3.63	149	3.59	140
13,	3.56	133	3.32	86	b6.56	m2090	3.68	161	3.80	194	3.20	66	3.00	40	3.18	63	3.00	40	3.31	84	3.59	140	3.55	131
14,	3.56	133	3.32	86	4.26	349	3.64	152	3.74	177	3.17	62	3.19	65	3.12	55	2.99	39	3.26	76	3.69	164	3.52	124
15,	3.55	131	3.32	86	5.53	m1180	3.62	147	3.71	169	3.15	59	3.21	68	3.05	46	2.98	38	3.18	63	3.64	152	3.48	116
16,	3.55	131	3.32	86	5.48	1080	3.63	149	4.15	309	3.24	72	3.06	47	3.02	42	3.96	244	3.15	59	3.59	140	3.44	108
17,	3.54	129	3.32	86	5.06	751	3.60	142	4.40	404	3.20	66	3.46	112	3.01	41	3.23	71	3.14	58	3.54	129	3.41	102
18,	3.59	140	3.27	77	4.61	497	c4.74	561	4.16	312	3.20	66	3.17	62	3.02	42	3.20	66	3.12	55	3.49	118	4.01	261
19,	3.79	191	3.25	74	4.45	425	4.41	408	4.04	272	3.16	60	3.08	50	3.26	76	3.19	65	3.11	53	3.44	108	3.84	206
20,	3.65	154	3.30	82	4.44	421	4.23	337	3.92	231	3.11	53	3.02	42	d3.88	218	3.24	72	3.08	50	3.39	98	3.74	177
21,	3.57	135	3.36	93	4.36	388	4.15	309	3.80	194	3.08	50	3.03	44	3.26	76	3.16	60	3.08	50	3.37	95	3.66	156
22,	3.51	122	a5.58	m1190	4.18	319	4.04	272	3.74	177	3.10	52	3.02	42	3.18	63	3.17	62	3.06	47	3.61	144	3.62	147
23,	3.47	114	3.80	194	4.07	282	3.98	251	3.71	169	3.11	53	3.00	40	3.14	58	3.18	63	3.59	140	3.58	138	3.59	140
24,	3.46	112	3.80	194	3.29	80	3.86	212	3.67	159	3.12	55	3.00	40	3.12	55	3.44	108	3.94	238	3.93	234	3.54	129
25,	3.44	108	3.88	218	3.32	86	3.82	200	3.63	149	3.12	55	3.00	40	3.09	51	4.39	400	3.67	159	3.71	169	3.50	120
26,	3.44	108	3.93	234	3.28	79	3.76	183	3.59	140	3.19	65	3.00	40	3.07	48	4.02	265	3.62	147	3.64	152	3.55	131
27,	3.44	108	4.74	561	3.17	62	3.82	200	3.56	133	3.16	60	3.00	40	3.05	46	3.88	218	3.58	138	3.61	144	3.65	154
28,	3.44	108	4.30	364	*3.46	112	3.67	159	3.46	112	3.10	52	3.00	40	3.04	45	3.74	177	3.54	129	3.54	129	3.61	144
29,	3.46	112	3.85	209	......	......	3.80	194	3.46	112	3.08	50	3.00	40	3.04	45	3.65	154	3.51	122	3.51	122	3.57	135
30,	3.43	106	......	......	......	......	3.94	238	3.49	118	3.08	50	3.00	40	3.02	42	3.59	140	3.46	112	3.48	116	3.96	244
31,	3.37	95	......	......	......	......	......	......	3.43	106	....	......	3.00	40	2.99	39	....	......	3.41	102	....	......	4.24	341

Notes—*Chain stolen on Mch 28th and replaced on April 3rd. a max. 5.85′ at 8:00 a. m.; m 1430 sec. ft. b max. 7.88′ at 8:00 a. m.; m 3340 sec. ft. c max. 5.05′ at 8:00 a. m.; 744 sec. ft. d max. 4.28′ at 8:00 a. m.; 356 sec. ft. m Estimated.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF McMICHAELS CREEK AT CAR SHOPS ABOVE STROUDSBURG, MONROE COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	4.14	306	3.67	159	3.84	206	4.40	404	4.22	334	3.32	86	3.05	46	b4.45	425	3.09	51	3.30	82	3.38	96	3.58	138
2,	4.05	275	3.64	152	3.76	183	4.17	316	4.06	278	3.31	84	3.05	46	3.56	133	3.03	44	3.38	96	3.34	89	3.47	114
3,	4.95	679	3.65	154	3.72	172	4.05	275	3.98	251	3.29	80	3.03	44	3.19	65	2.96	35	3.26	76	3.31	84	3.37	95
4,	4.59	487	3.54	129	3.69	164	4.00	258	3.90	224	3.27	77	3.02	42	3.06	47	2.92	30	3.14	58	3.27	77	3.34	89
5,	4.44	421	3.52	124	3.67	159	3.94	238	3.86	212	3.26	76	3.01	41	3.00	40	3.07	48	3.05	46	3.22	69	3.32	86
6,	4.25	345	3.54	129	3.68	161	3.87	215	3.84	206	3.29	80	2.99	39	2.95	34	3.03	44	3.00	40	3.20	66	3.31	84
7,	4.14	306	3.52	124	3.63	149	3.81	197	3.74	177	3.30	82	2.99	39	2.94	33	2.97	36	3.04	45	3.16	60	3.74	177
8,	4.68	530	3.50	120	3.58	138	3.74	177	3.69	164	3.29	80	2.97	36	2.91	29	2.95	34	3.07	48	3.11	53	3.73	174
9,	4.54	464	3.48	116	3.53	127	3.68	161	3.66	156	3.27	77	2.98	38	2.88	26	2.93	32	3.06	47	c5.28	912	3.62	147
10,	4.28	356	3.46	112	3.49	118	3.65	154	3.62	147	3.25	74	3.09	51	2.87	25	2.91	29	3.04	45	5.40	1010	3.54	129
11,	4.17	316	3.44	108	3.80	194	4.00	258	3.59	140	3.21	68	3.00	40	2.97	36	2.91	29	3.03	44	4.55	469	3.47	114
12,	4.38	376	3.42	104	3.67	159	4.77	576	3.56	133	3.21	68	3.01	41	2.95	34	2.89	27	3.02	42	4.20	326	3.44	108
13,	4.05	275	3.42	104	3.65	154	4.65	516	3.54	129	3.21	68	3.13	56	2.92	30	2.87	25	3.02	42	4.04	272	3.42	104
14,	3.92	231	3.44	108	5.17	828	4.56	474	3.53	127	3.19	65	3.04	45	2.89	27	2.86	24	3.00	40	3.90	224	3.40	100
15,	3.84	206	3.43	106	5.18	836	4.75	566	3.52	124	3.17	62	2.97	36	2.87	25	2.85	23	2.99	39	3.73	174	3.37	95
16,	3.86	212	3.44	108	4.86	626	4.59	487	3.50	120	3.15	59	2.96	35	2.87	25	2.86	24	2.97	36	3.76	183	3.36	93
17,	4.02	265	3.43	106	4.43	417	4.29	360	3.47	114	3.13	56	2.95	31	2.89	27	2.87	25	2.96	35	3.94	238	3.35	91
18,	4.00	258	3.44	108	4.13	302	4.07	282	3.44	108	3.12	55	2.95	34	3.01	41	2.89	27	2.96	35	3.78	188	3.34	89
19,	3.94	238	3.44	108	3.99	255	3.93	234	3.44	108	3.11	53	2.94	33	3.10	52	2.90	28	2.95	34	3.62	147	3.32	86
20,	3.87	215	3.39	98	4.76	571	3.87	215	3.40	100	3.10	52	2.93	32	2.88	26	2.90	28	3.51	122	3.58	138	3.44	108
21,	3.82	200	3.34	89	4.46	429	3.83	203	3.38	96	3.16	60	2.93	32	2.88	26	2.92	30	3.45	110	3.56	133	3.97	248
22,	3.72	172	3.47	114	4.40	404	3.80	194	3.35	91	3.13	56	2.97	36	2.90	28	3.84	206	3.36	93	3.54	129	3.46	112
23,	3.67	159	3.43	106	4.10	292	3.78	188	3.40	100	3.11	53	3.09	51	3.13	56	3.24	72	3.31	84	3.52	124	3.49	118
24,	3.66	156	3.41	102	4.01	261	3.73	174	4.00	258	3.11	53	3.07	48	3.01	41	3.16	60	3.26	76	3.52	124	4.24	341
25,	3.63	149	3.39	98	3.94	238	3.68	161	3.73	174	3.09	51	3.05	46	2.95	34	3.09	51	4.49	442	3.50	120	4.00	258
26,	3.60	142	3.39	98	4.16	312	3.66	156	3.50	120	3.09	51	2.98	38	2.91	29	3.05	46	4.27	353	3.48	116	4.10	292
27,	3.56	133	3.44	108	a6.64	m2170	3.63	149	3.33	87	3.09	51	2.95	34	2.94	33	3.05	46	3.84	206	3.46	112	3.94	238
28,	3.56	133	4.09	289	5.99	m1570	5.25	889	3.53	127	3.09	51	2.90	28	2.93	32	2.97	36	3.74	177	3.47	114	3.79	191
29,	3.54	129	....	......	5.23	873	4.33	376	3.48	116	3.08	50	2.87	25	3.02	42	3.07	48	3.62	147	3.82	200	3.66	156
30,	3.52	124	....	......	5.00	710	4.28	356	3.41	102	3.07	48	2.87	25	3.19	65	3.10	52	3.53	127	3.66	156	3.60	142
31,	3.52	124	....	......	4.76	571	....	......	3.35	91	....	......	2.86	24	3.14	58	....	......	3.42	104	......	......	3.56	133

Notes.—aMax. 8.02′ at 4:35 p. m.; m3470 sec. ft. bMax. 6.07′ at 4:30 p. m.; m1640 sec. ft. cMax. 6.42′ at 4:50 p. m.; m1960 sec. ft. mEstimated.

ESTIMATED MONTHLY DISCHARGE OF McMICHAELS CREEK, AT CAR SHOPS ABOVE STROUDSBURG, MONROE COUNTY, PA.

(Drainage area 60 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1911.					
September,	497	63	134	2.233	2.491
October,	m1160	77	211	3.517	4.055
November,	492	110	164	2.733	3.049
December,	408	96	169	2.817	3.248
1912.					
January,	191	95	127	2.117	2.441
February,	m1430	56	166	2.767	2.984
March (1-28),	m3340	62	362	6.033	6.282
April (3-30),	744	142	243	4.050	4.217
May,	469	106	206	3.433	3.958
June,	108	50	70	1.167	1.302
July,	112	38	46	0.767	0.884
August,	356	36	60	1.000	1.153
September,	400	38	95	1.583	1.766
October,	238	47	93	1.550	1.787
November,	285	95	144	2.400	2.678
December,	285	102	172	2.867	3.305
The period,	m3340	36	149	2.478	32.757
1913.					
January,	679	124	270	4.500	5.188
February,	289	89	121	2.017	2.100
March,	m3470	118	444	7.400	8.531
April,	889	149	307	5.117	5.709
May,	334	87	152	2.533	2.920
June,	86	48	64	1.067	1.191
July,	56	24	39	0.650	0.749
August,	m1640	25	52	0.867	0.999
September,	206	23	43	0.717	0.800
October,	442	34	96	1.600	1.845
November,	m1960	53	207	3.450	3.849
December,	341	84	144	2.400	2.767
The year,	m3470	23	162	2.356	36.648

m Estimated.

LEHIGH RIVER.

DESCRIPTION OF BASIN.

The Lehigh river, the second largest tributary of the Delaware river from Pennsylvania, drains approximately 1,375 square miles in the central-eastern portion of the State. Rising in the Pocono plateau in the southwest corner of Wayne county, it follows a winding course, generally southeasterly to its mouth at Easton, its length being approximately 100 miles, while the air line distance from its source to its mouth is only 45 miles.

The sources of the upper tributaries lie among the Pocono mountains, which are sparsely inhabited, and largely forested. The slope of the river is steep, with numerous rapids, water falls, and glacial lakes. The stream falls about 10 feet per mile until within 15 or 20 miles of the mouth, where it enters the rolling farm lands of Lehigh and Northampton counties, where its slope reduces to 4 or 5 feet per mile. In this portion of the valley is much cultivated land and numerous large cities and boroughs, among the most important being Allentown, South Bethlehem, Bethlehem and Easton.

Numerous of its lower tributaries, among them the little Lehigh, Jordan, Monocacy and Saucon creeks, drain limestone areas, thus augmenting the dry weather flow. From the west, where the Lehigh passes the anthracite coal fields, the tributaries bring in quantities of culm and mine water.

The chief tributaries are Tobyhanna, Bear, Black, Mahoning, Big, Lizard, Aquauchicola, Jordan, Little Lehigh, Monocacy and Saucon creeks.

The banks, especially in the upper portion, are high and rocky, and, below Mauch Chunk and White Haven, the valley assumes the nature of a gorge. The bed is rock throughout most of its length, in places overlain by a thin layer of drift and, in its lower section behind the navigation dams, extensive silting has taken place.

The Lehigh Coal and Navigation Company operates a canal and slackwater system of navigation on the lower 45 miles, consisting of 10 dams and locks, and several short sections of canal connecting the pools. Considerable water-power is developed along this canal.

Numerous towns and industries in the lower section, in which portion of the valley population and industries are quite congested, use the river water for domestic and industrial purposes.

The basin, which is long and narrow, is subject to an annual average precipitation of 45 to 50 inches.

The flow has been measured from September 22, 1902, to February 13, 1905, and from April 26, 1909, to date at South Bethlehem, 12 miles above the mouth.

DELAWARE BASIN—STATION NO. 12.

LEHIGH RIVER AT SOUTH BETHLEHEM.

DESCRIPTION OF STATION.

LOCATION—On New Street bridge, a 9 span, steel, through-truss, highway bridge, with 3 spans over normal channel, between Bethlehem and South Bethlehem, Pa.

RECORDS AVAILABLE—Discharge complete from September 22, 1902, to February 13, 1905, and from April 26, 1909 to December 31, 1913.

DRAINAGE AREA—1,235 square miles.

GAGE—A standard chain gage is fastened to the downstream handrail in first span from left bank of normal channel. The elevation of zero is 210.64 feet above mean sea level. The length of chain from bottom of weight to low-water marker is 42.91 feet, and to high-water marker 32.91 feet. Bench Mark No. 1 given in 1910-11 Report has been destroyed. Bench Mark No. 2 is B. M. No. 72 of L. V. R. R. and is iron pin set in south pier of New Street bridge, elevation 232.87 feet above mean sea level, or 22.23 feet above zero of gage. Bench Mark No. 3 is cross cut on shelf in stone on fourth pier from north side, 15th course down from top of pier, downstream face, 2 feet in from left or north downstream corner, elevation 228.06 feet above mean sea level, or 17.42 feet above zero of gage. The gage is read twice daily by J. E. Santee, the Collector of Tolls at the bridge.

DISCHARGE MEASUREMENTS—Taken from the downstream side of bridge, the initial point for soundings being point on handrail over center of pier between 3rd and 4th trusses from left bank.

CHANNEL—The channel above the station is straight for one-third mile, at which point a covered wooden highway bridge crosses the stream at Main Street. Below the station the channel is straight for several hundred feet. The right bank is high and not subject to overflow, while the left bank is low and overflows during high water. The bed consists of sand and gravel, and there is a good velocity at the section during all stages.

REMARKS—The Lehigh Canal follows the left bank and passes over Monocacy creek and under the left span of the bridge. Monocacy creek passes under the canal on left bank and under the bridge, entering the river a short distance below. The canal is measured at the Main Street bridge, one-third mile above, and the discharge, reduced by the tailrace flow of ice plant and grist mill, which use canal water between these two bridges, is added to the river discharge during certain periods of the year as measured at the New Street bridge. The canal cannot be measured at the New Street bridge on account of the spillway from the canal into Monocacy creek at the aqueduct above the New Street bridge.

DISCHARGE MEASUREMENTS OF LEHIGH RIVER, AT S. BETHLEHEM, NORTHAMPTON COUNTY, PA.

(Drainage area 1235 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
43	July 24	Boehringer, ...	280	856	1.16	2.34	994	0.6 method.
44	Sept. 3	Reckord, ...	268	651	0.54	1.66	353	Vertical velocity method.

DISCHARGE TABLE FOR LEHIGH RIVER, AT SOUTH BETHLEHEM, NORTHAMPTON COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.50	255	.60	2750	6.00	8130	.10	13790	.20	20130
.60	325	.70	2920	.10	8380	.20	14080	.30	20450
.70	400	.80	3100	.20	8640	.30	14370	.40	20770
.80	480	.90	3280	.30	8900	.40	14660	.50	21090
.90	565	4.00	3470	.40	9160	.50	14950	.60	21410
2.00	655	.10	3670	.50	9420	.60	15240	.70	21740
.10	750	.20	3870	.60	9680	.70	15530	.80	22070
.20	850	.30	4070	.70	9940	.80	15820	.90	22400
.30	950	.40	4280	.80	10200	.90	16120	11.00	22730
.40	1060	.50	4500	.90	10470	9.00	16420	.10	23070
.50	1170	.60	4720	7.00	10740	.10	16720	.20	23410
.60	1280	.70	4940	.10	11010	.20	17020	.30	23750
.70	1400	.80	5170	.20	11280	.30	17320	.40	24090
.80	1530	.90	5400	.30	11550	.40	17630	.50	24430
.90	1670	5.00	5640	.40	11820	.50	17940	.60	24770
3.00	1810	.10	5880	.50	12100	.60	18250	.70	25110
.10	1950	.20	6130	.60	12380	.70	18560	.80	25450
.20	2100	.30	6380	.70	12660	.80	18870	.90	25790
.30	2260	.40	6630	.80	12940	.90	19180	12.00	26130
.40	2420	.50	6880	.90	13220	10.00	19490		
.50	2580	.60	7130	8.00	13500	.10	19810		
		.70	7380						
		.80	7630						
		.90	7880						

Note.—This table is only applicable subsequent to January 1, 1912 and is based on 5 discharge measurements made during 1911 and 1913 together with the 1902 to 1905 curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF LEHIGH RIVER AT S. BETHLEHEM, NORTHAMPTON COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1.	4.51	4520	3.36	2360	3.65	2840	5.18	6080	6.16	8540	2.95	1780	2.03	728	1.89	602	1.88	593	1.95	655	2.74	1500	2.86	1660
2,	4.35	4180	3.17	2060	3.27	2210	4.64	4810	5.45	6760	2.78	1550	2.02	719	1.83	550	1.85	568	3.26	2210	2.60	1320	2.82	1600
3,	4.79	5150	3.18	2070	3.08	1920	4.36	4200	5.00	5640	2.75	1510	1.94	646	1.73	469	1.62	385	2.75	1510	2.69	1430	2.67	1410
4,	6.84	10300	3.19	2080	3.02	1840	4.20	3870	4.69	4920	2.78	1550	1.85	568	1.87	584	1.64	400	2.52	1240	2.58	1300	2.61	1340
5,	6.43	9240	2.97	1770	3.03	1850	4.15	3770	4.34	4150	2.72	1470	2.00	700	1.82	542	1.75	485	2.27	965	2.49	1200	2.58	1300
6,	4.97	5570	2.82	1560	2.89	1660	3.95	3380	4.14	3750	2.61	1340	1.97	673	1.82	542	1.73	469	2.33	1030	2.42	1130	2.58	1300
7,	4.68	4900	2.63	1320	2.51	1180	3.76	3030	3.98	3430	2.54	1260	2.02	719	2.35	1050	1.72	461	2.08	776	2.37	1070	2.73	1480
8,	5.14	5980	2.68	1380	2.29	940	3.63	2800	3.75	3010	2.49	1200	1.90	610	2.03	728	2.00	700	2.01	710	2.38	1080	3.54	2690
9,	5.73	7460	2.64	1330	2.77	1490	3.50	2580	3.63	2800	2.56	1280	1.96	664	1.85	568	1.86	576	2.05	748	3.56	2730	3.47	2580
10,	5.11	5900	2.77	1490	2.89	1660	3.40	2420	3.50	2580	2.48	1190	2.78	1550	1.72	461	1.67	422	2.02	719	6.09	8400	3.11	2010
11,	3.95	3360	2.70	1400	3.04	1870	3.66	2850	3.44	2480	2.41	1120	2.24	935	1.90	610	1.69	438	2.01	710	4.74	5080	3.02	1880
12,	4.89	5380	2.70	1400	3.07	1910	5.65	7260	3.32	2290	2.37	1070	2.07	766	1.80	525	1.68	430	2.20	895	4.03	3580	2.92	1740
13,	5.00	5640	2.61	1290	3.03	1850	5.19	6100	3.22	2130	2.34	1040	2.23	925	1.88	593	1.66	415	2.33	1030	3.67	2910	2.83	1570
14,	4.49	4480	2.52	1190	5.02	5690	5.41	6660	3.14	2010	2.28	975	2.26	955	1.61	378	1.60	370	2.07	766	3.50	2620	2.81	1540
15,	4.28	4030	2.53	1200	6.58	9630	5.20	6130	3.00	1810	2.22	915	2.18	875	1.64	400	1.69	438	1.98	682	3.36	2400	2.85	1600
16,	4.16	3790	2.63	1320	6.52	9470	5.04	5740	2.95	1740	2.28	975	2.08	776	1.57	349	1.63	392	1.82	542	3.25	2220	2.80	1530
17,	4.21	3890	2.76	1480	5.37	6560	4.62	4760	2.90	1720	2.21	905	1.99	691	1.99	691	1.61	378	1.93	637	3.57	2740	2.73	1440
18,	4.11	3690	2.57	1250	4.69	4920	4.44	4370	2.87	1670	2.17	865	1.98	682	1.96	664	1.65	408	1.86	576	3.29	2290	2.68	1380
19,	3.98	3430	2.59	1270	4.62	4760	4.22	3910	2.86	1660	2.17	865	1.96	664	1.82	542	1.63	392	1.76	493	3.22	2180	2.59	1270
20,	3.90	3280	2.57	1250	4.99	5620	3.96	3390	2.74	1500	2.20	895	1.84	559	1.75	485	1.67	422	2.48	1190	3.17	2100	2.53	1200
21,	3.89	3260	2.62	1300	4.88	5350	3.83	3150	2.69	1430	2.55	1270	1.91	619	1.72	461	1.84	559	3.16	2080	3.08	1970	2.47	1140
22,	3.85	3190	2.80	1530	4.68	4900	3.67	2870	2.68	1420	2.47	1180	1.88	593	1.75	485	3.63	2850	2.94	1770	3.02	1880	2.58	1260
23,	3.72	2960	3.31	2280	4.33	4130	3.60	2750	2.66	1400	2.37	1070	1.82	542	1.76	493	2.93	1760	2.73	1480	2.90	1720	2.63	1320
24,	3.89	3260	2.89	1660	4.21	3890	3.53	2630	3.92	3360	2.23	925	2.21	905	1.77	501	2.41	1120	2.60	1320	2.92	1740	3.59	2730
25,	3.82	3140	2.61	1290	4.05	3570	3.43	2470	3.35	2380	2.11	805	2.23	925	1.74	477	2.13	825	3.75	3060	2.79	1560	3.54	2650
26,	3.68	2890	2.53	1200	4.25	3970	3.33	2310	3.12	2020	2.14	835	2.07	766	1.74	477	2.04	738	4.30	4120	2.69	1430	4.54	4590
27,	3.69	2900	2.74	1450	a9.87	19100	3.59	2730	3.00	1860	2.18	875	1.88	593	1.64	400	1.87	584	3.94	3400	2.61	1340	4.18	3830
28,	3.65	2840	4.56	4630	9.77	18800	b10.85	22200	3.11	2010	2.23	925	1.96	664	1.69	438	1.76	493	3.59	2780	2.73	1480	3.69	2900
29,	3.45	2500	....	......	7.40	11800	8.90	16100	3.27	2260	2.09	786	1.90	610	1.79	517	1.75	485	3.27	2260	2.76	1520	3.43	2470
30,	3.37	2370	....	......	6.20	8640	7.41	11800	3.13	2040	2.09	786	1.92	628	1.82	542	1.69	438	3.04	1910	2.82	1600	3.31	2280
31,	3.45	2500	....	......	5.65	7260	......	......	3.07	1950	....	......	1.82	542	1.83	550	....	......	2.86	1660	....	......	3.21	2120

Note.—a Max. 12.40 at 6:30 p. m.; 27500 (est.) sec. ft. b max. 11.0 at 1:00 p. m.; 22700 sec. ft. (May 17 to Dec. 12) 45 sec. ft. added to daily discharge for canal.

ESTIMATED MONTHLY DISCHARGE OF LEHIGH RIVER, AT SOUTH BETHLEHEM, NORTHAMPTON COUNTY, PA.

(Drainage area 1235 square miles.)

Month.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	10300	2370	4390	3.555	4.098
February,	4630	1190	1640	1.328	1.383
March,	*27500	940	5200	4.211	4.855
April,	22700	2310	5240	4.243	4.734
May,	8540	1400	2800	2.267	2.614
June,	1780	786	1110	0.899	1.003
July,	1550	542	735	0.595	0.686
August,	1050	349	538	0.436	0.503
September,	2850	370	633	0.513	0.572
October,	4120	493	1420	1.150	1.326
November,	8400	1070	2180	1.765	1.970
December,	4590	1140	1930	1.563	1.802
The year,	*27500	349	2330	1.877	25.546

*Estimated.

DELAWARE BASIN—STATION NO. 13.

DELAWARE RIVER AT RIEGELSVILLE, N. J.

DESCRIPTION OF STATION.

LOCATION—On three span, steel, suspension highway bridge, between Riegelsville, Pa., and Riegelsville, N. J.

RECORDS AVAILABLE—Discharge complete from July 3, 1906, to December 31, 1912, and discharge measurements and gage heights from January 1 to December 31, 1913.

DRAINAGE AREA—6,430 square miles.

GAGE—A standard chain gage is attached to the upstream handrail on the middle span of the bridge, 20 feet from east pier. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 43.68 feet. Bench Mark No. 1 is on top of steel part of downstream cable anchorage on New Jersey side, elevation 40.765 feet above gage datum. Bench Mark No. 2 is southeast corner of porch under toll-keeper's house, outside of post, elevation 39.365 feet above gage datum. Bench Mark No. 3 is spike in bench 6 inches above ground on shore side of silver maple. Tree is one nearest the bridge in a group about 200 feet upstream from left abutment, elevation 12.30 feet above gage datum. The gage is read twice daily by John H. Deemer.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for sounding is face of left abutment.

CHANNEL—The channel above and below the station is straight for one-half and one-fourth mile respectively. Both banks are high and not subject to overflow, although during extreme floods the right bank may overflow to a slight degree. The bed consists of gravel and boulders.

REMARKS—The Delaware Division Canal runs along the Pennsylvania shore about 200 feet from the river, and is measured at the highway bridge a short distance above the river bridge.

The following data have been furnished by the United States Geological Survey:

DISCHARGE MEASUREMENTS OF DELAWARE RIVER, AT RIEGELSVILLE, NEW JERSEY.

(Drainage area 6430 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
18	July 25	Boehringer, ...	451	3465	0.69	2.61	2376	0.6 msmt.
19	Sept. 10	Batchelder & Walters,	434	3170	0.50	2.21	1570	Add 224 sec. ft. for canal.

DAILY MEAN GAGE HEIGHTS OF DELAWARE RIVER AT RIEGELSVILLE, NEW JERSEY.

1913.	JAN.	FEB.	MARCH.	APRIL	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H
1,	8.0	5.6	6.0	10.5	8.8	5.8	2.65	2.3	2.35	2.6	4.3	4.9
2,	7.7	5.5	7.9	9.8	7.9	5.3	2.65	4.3	2.25	4.1	4.1	4.9
3,	7.7	5.2	6.1	8.6	7.2	5.0	2.55	3.1	2.15	3.9	4.0	4.6
4,	10.5	5.0	5.6	8.1	6.6	4.7	2.5	2.85	2.1	3.7	3.8	4.5
5,	11.8	4.4	5.4	7.8	6.1	4.5	2.45	2.55	2.35	3.4	3.7	4.4
6,	9.8	4.5	5.2	7.7	5.9	5.2	2.5	2.4	2.15	3.2	3.6	4.3
7,	8.8	*4.0	4.8	7.4	5.6	4.6	2.6	2.85	2.1	3.0	3.5	4.4
8,	9.4	*3.8	*4.1	6.8	5.2	4.3	2.55	2.65	2.8	2.95	3.4	5.2
9,	16.0	4.0	4.2	6.4	5.0	4.3	2.45	2.55	2.3	2.9	4.6	6.0
10,	12.7	4.2	4.3	6.1	4.7	4.2	3.3	2.5	2.2	2.85	11.2	5.9
11,	10.5	*4.0	5.2	6.0	4.6	3.9	2.65	2.4	2.1	2.8	12.8	5.4
12,	9.8	*4.0	5.6	9.0	4.5	3.7	2.45	2.35	2.15	3.1	9.5	5.1
13,	10.4	*3.7	5.6	10.3	4.4	3.6	2.5	2.25	2.15	3.3	7.9	4.9
14,	9.4	*3.6	7.1	9.6	4.2	3.5	2.8	2.25	2.0	3.1	6.9	4.8
15,	7.9	3.8	12.1	9.2	4.1	3.4	2.55	2.2	2.05	3.0	6.5	4.8
16,	7.6	3.9	12.4	9.1	4.0	3.4	2.5	2.2	2.05	2.9	6.3	4.7
17,	7.5	4.0	10.9	8.2	4.0	3.2	2.4	2.25	1.9	2.8	6.4	4.6
18,	7.8	3.8	9.3	7.6	3.9	3.1	2.45	2.35	2.0	2.8	6.0	4.5
19,	8.6	3.8	8.2	7.1	3.9	3.0	2.45	2.25	2.0	2.65	5.8	4.3
20,	8.5	3.8	8.3	6.7	3.8	3.0	2.35	2.2	2.1	3.1	5.7	4.2
21,	7.9	3.9	9.3	6.2	3.7	3.3	2.25	2.25	2.2	4.0	5.6	4.0
22,	7.8	4.0	9.3	5.9	3.7	3.3	2.25	2.15	3.8	4.6	5.5	4.1
23,	7.7	4.9	8.8	5.7	3.8	3.2	2.2	2.25	3.6	5.0	5.4	4.2
24,	7.3	4.5	8.0	5.6	5.4	3.1	2.1	2.25	3.7	4.4	5.1	5.3
25,	7.3	4.5	7.9	5.4	6.0	3.0	2.6	2.2	3.6	5.2	4.9	5.2
26,	7.1	4.6	8.3	5.2	5.7	2.9	2.5	2.2	3.2	6.4	4.8	6.4
27,	6.7	4.4	13.3	5.2	5.1	3.0	2.3	2.15	2.9	6.7	4.6	6.2
28,	6.5	6.2	24.4	10.3	5.0	3.1	2.4	2.05	2.6	6.1	4.6	5.5
29,	6.1	....	18.8	11.0	5.3	3.0	2.4	2.15	2.6	5.4	4.6	*5.0
30,	5.7	....	13.8	10.2	6.8	2.95	2.4	2.1	2.5	4.9	4.7	4.6
31,	5.6	....	11.6	....	6.4	....	2.35	2.2	....	4.6	....	4.5

Note.—Water in canal April 15 to Dec. 15, inclusive. *Slush ice.

DARBY CREEK.

DESCRIPTION OF BASIN.

Darby creek, a tributary of the Delaware river, at Essington, Philadelphia county, drains approximately 78 square miles in Chester, Philadelphia and Delaware counties. Rising in the eastern part of Chester county, near Berwyn, it follows a general southeasterly direction through a thickly populated, deforested, rolling agricultural region, to the tidal swamps of the Delaware river just below Darby borough, where it turns southwestward along the western side of the swamp to its mouth, a total length of approximately 24 miles. Its source lies at an elevation of about 475 feet above sea level, and its mouth at sea level. In its upper section the slope of the stream is steep, while in the lower section it is very flat. The principal tributary is Cobbs creek, which enters six miles above its mouth. A few mills operated by water-power exist on this stream.

The mean annual precipitation over this watershed is from 45 to 50 inches.

The flow has been measured since July 31, 1911, at Lansdowne, approximately 8 miles above the mouth, above which the tributary drainage area is 35 square miles.

DELAWARE BASIN—STATION NO. 14.

DARBY CREEK AT LANSDOWNE, PA.

DESCRIPTION OF STATION.

LOCATION—About one-fourth mile above single span, iron highway bridge (county) on road from Lansdowne to Upper Darby township, Delaware county.

RECORDS AVAILABLE—Discharge measurements and gage heights from July 31, 1911, to December 31, 1913.

DRAINAGE AREA—35 square miles.

GAGE—A 10 foot staff gage is attached to a tree on the west bank of the creek, about one-fourth mile above highway bridge. Also, there is a high water staff gage, graduated from 5.0 to 11.0 feet, attached to a tree 10 paces from low water gage. Both gages are referred to the same datum. The elevation of zero is arbitrary. Bench Mark No. 1 is on top of spike in groove cut in root of a large white walnut tree on south bank, 15 paces from low water gage and 10 paces from high water gage, and is painted B. M., elevation 6.695 feet above gage datum. The gage is read twice daily by Charles H. Baker.

DISCHARGE MEASUREMENTS—Taking from the highway bridge during high stages, and by wading near the gage during medium and low stages. The initial point for soundings is right end of upstream handrail.

CHANNEL—The channel above and below the station is straight for approximately 100 yards. The right bank slopes gradually but seldom overflows, while the left bank is high and steep, and is not subject to overflow. The bed consists of mud, gravel and stone.

REMARKS—Slack water from the dam of the Garrett Paper Mill extends to a point about 75 to 80 yards below the gage.

DISCHARGE MEASUREMENTS OF DARBY CREEK, AT LANSDOWNE, DELAWARE COUNTY, PA.

(Drainage area 35 square miles.)

No.	Date.		Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
				Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913								
6	July	26	Boehringer, ...	39	23	0.83	0.86	19	Wading 100′ below gage.
7	Aug.	2	Boehringer, ...	49	24	1.04	0.99	25	Wading msmt. below gage.
8	Oct.	1	Reckord, ...	50	41	0.71	1.18	29	Wading 300′ below gage.

DAILY MEAN HEIGHTS OF DARBY CREEK AT LANSDOWNE, DELAWARE COUNTY, PA.

1913.	JAN.	FEB.	MARCH.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H
1,	1.21	1.41	1.25	1.30	1.40	1.60	1.00	0.85	0.55	2.40	1.40	1.75
2,	1.12	1.50	1.32	1.36	1.43	1.45	1.15	0.80	0.65	1.02	1.95	1.80
3,	a2.02	1.46	1.22	1.38	1.50	1.48	1.35	1.10	0.65	0.65	1.95	1.55
4,	1.22	1.50	1.35	1.32	1.70	1.50	1.25	1.05	0.40	0.50	1.60	1.75
5,	1.21	1.41	1.40	2.05	1.55	1.43	1.25	0.85	0.48	0.75	1.95	1.95
6,	1.16	1.46	1.36	1.50	1.42	1.45	1.25	1.10	0.75	0.60	2.05	1.75
7,	1.21	1.42	1.39	1.40	1.40	1.50	1.10	0.70	1.00	0.60	2.00	2.65
8,	1.12	1.51	1.44	1.40	1.30	1.51	0.95	0.90	1.05	0.50	1.90	2.50
9,	1.15	1.55	1.45	1.38	1.40	1.48	1.05	1.15	0.65	0.60	2.30	2.35
10,	1.18	1.42	1.32	1.40	1.38	1.41	1.05	0.85	0.45	0.60	1.15	2.25
11,	1.21	1.35	1.81	1.40	1.50	1.40	0.90	0.90	0.65	0.75	1.10	2.55
12,	1.30	1.36	1.25	c2.90	1.40	1.50	0.75	0.80	0.65	d3.00	1.35	2.45
13,	1.21	1.45	1.14	1.58	1.35	1.45	1.58	1.00	0.50	2.45	1.15	2.65
14,	1.25	*1.48	1.75	1.49	1.26	1.44	0.90	1.50	0.55	1.10	1.25	2.55
15,	1.36	1.55	1.81	1.52	1.38	1.34	1.10	0.65	0.90	0.75	1.15	2.75
16,	1.42	1.60	1.50	3.05	1.50	1.35	0.80	0.95	0.80	0.75	1.60	2.50
17,	1.78	1.42	1.28	1.61	1.50	1.50	0.95	0.80	0.55	1.10	1.05	1.05
18,	1.31	1.48	1.30	1.51	1.60	1.45	0.75	0.90	0.55	1.15	1.05	0.90
19,	1.34	1.32	1.32	1.46	1.32	1.40	0.95	0.90	0.58	1.00	1.25	0.85
20,	1.30	1.36	b2.76	1.50	1.42	1.15	0.60	0.70	0.95	0.45	1.30	0.80
21,	1.32	1.40	1.56	1.45	1.40	1.85	0.80	1.05	0.95	0.60	1.25	1.05
22,	1.26	1.42	1.38	1.41	1.78	1.80	0.65	1.20	1.05	0.90	1.15	1.05
23,	1.35	1.52	1.40	1.32	1.85	1.40	0.95	0.95	0.90	0.50	1.35	1.35
24,	1.45	1.40	1.22	1.31	1.90	1.30	0.90	0.88	0.78	0.40	1.25	1.65
25,	1.32	1.28	1.31	1.38	1.60	1.40	0.95	1.10	0.50	0.55	1.05	1.75
26,	1.42	1.31	1.42	1.40	1.50	1.10	0.55	0.80	0.80	0.70	1.25	2.95
27,	1.42	1.51	2.40	1.62	1.48	1.25	0.55	0.80	0.90	1.15	1.15	2.45
28,	1.42	1.64	1.91	3.02	2.20	1.46	1.15	0.70	0.55	1.25	1.50	2.10
29,	1.34	....	1.42	2.00	1.60	1.50	1.22	1.05	0.55	1.05	1.70	1.75
30,	1.38	....	1.40	1.42	1.58	1.05	0.95	1.22	0.85	0.85	1.55	1.65
31,	1.33	....	1.38	....	1.50	....	1.05	1.00	....	1.30	....	1.50

Note.—*Ice along bank. a Max. 2.55 at 6 a. m. b Max. 3.01 at 6 p. m. c Max. 3.8 at 6 a. m. d Max. 4.00 at 6 a. m.

BRANDYWINE CREEK.

DESCRIPTION OF BASIN.

Brandywine creek, a large tributary of the Delaware river in Pennsylvania, which passes through the northern part of the State of Delaware and enters the river just below Wilmington, drains approximately 300 square miles in Pennsylvania. Rising in two branches, the east and west, which head on the western edge of Chester county in the Welsh Mountains within a few miles of each other, these branches diverge, one passing through Downingtown and the other through Coatesville about 10 miles apart, and then meet about one mile north of Lenape, in the south central part of Chester county. The stream and its branches flow in a general southerly direction through a rolling country, thickly populated, well developed agriculturally and practically deforested, its total length in Pennsylvania being about 35 miles. The elevation of the sources of the two branches is about 900 feet; at the State line it is 140 feet, and at the mouth sea level. The slope of the stream is gradual, but steep enough to cause small waterpowers to be extensively developed along it and its branches. On the drainage basin lie numerous towns and villages, several of which obtain water from the branches.

The mean annual precipitation over this watershed is from 45 to 50 inches.

The discharge of this stream has been measured since August 1, 1911, at Chadds Ford, near the Pennsylvania-Delaware State line, about 10 miles above the mouth, the drainage area above the gage being approximately 285 square miles.

DELAWARE BASIN—STATION NO. 15.

BRANDYWINE CREEK AT CHADDS FORD, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, iron girder bridge of Pennsylvania Railroad over creek at Chadds Ford, Delaware county.

RECORDS AVAILABLE—Discharge measurements and gage heights from August 1, 1911, to December 31, 1913.

DRAINAGE AREA—285 square miles.

GAGE—A standard chain gage is fastened on the upstream side of the bridge in the left span. The elevation of zero is arbitrary. The length of chain from bottom of weight to marker is 23.97 feet. Bench Mark No. 1 is outside upstream corner of left bridge seat stone, elevation 18.49 feet above gage datum. Bench Mark No. 2 is top of outer corner of stone, 5th step in left upstream wingwall from bridge seat, elevation 927 feet above gage datum. The gage is read twice daily by E. J. Reynolds.

DISCHARGE MEASUREMENTS—Discharge measurements are taken from the upstream side of the bridge. The initial point for soundings is cross mark cut in handrail at face of left abutment, upstream side.

CHANNEL—The channel is straight for 50 yards above the station, then curves to the west, and there is a tail race of a mill coming in about 50 yards above the bridge. Below the station the channel is straight for 80 yards, then curves to the west. The right bank of the natural creek is low and flat, while the left bank as well as the right flood bank is high and steep. The bed is composed of mud, stones and gravel.

DISCHARGE MEASUREMENTS OF BRANDYWINE CREEK, AT CHADDS FORD, DELAWARE COUNTY, PA.

(Drainage area 285 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
7	July 26	Boehringer, ...	104	276	0.74	1.18	203	0.6 method.
8	Oct. 1	Reckord, ...	106	264	0.54	1.08	142	0.2 and 0.8 method.

DAILY MEAN GAGE HEIGHTS OF BRANDYWINE CREEK AT CHADDS FORD, DELAWARE COUNTY, PA.

1913.	JAN.	FEB.	MARCH.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H
1,	2.80	1.99	2.20	2.30	2.98	2.10	1.45	1.24	1.23	1.51	1.24	1.44
2,	2.45	1.72	2.00	2.18	2.81	2.08	1.41	1.49	1.20	1.70	1.22	1.42
3,	4.17	2.06	1.82	2.18	2.70	2.00	1.39	1.17	1.09	1.41	1.20	1.30
4,	3.20	2.40	1.82	2.18	2.56	1.94	1.37	1.13	1.07	1.34	1.28	1.24
5,	2.32	2.06	1.80	3.12	2.49	1.92	1.35	1.11	1.03	1.27	1.26	1.22
6,	2.23	1.94	1.77	2.20	2.46	1.88	1.63	1.11	1.17	1.17	1.22	1.22
7,	2.30	1.96	1.54	2.09	2.42	1.85	1.43	3.07	1.11	1.12	1.17	1.80
8,	2.83	1.96	1.50	2.04	2.36	1.74	1.33	1.45	1.41	1.15	1.18	1.78
9,	2.57	1.86	1.62	2.00	2.29	1.75	1.36	1.29	1.17	1.15	1.58	1.44
10,	2.08	1.81	1.78	1.94	2.23	1.74	1.79	1.22	1.03	1.13	1.86	1.34
11,	2.26	1.84	2.50	2.12	2.18	1.73	1.39	1.75	1.03	1.14	1.53	1.29
12,	2.30	1.76	2.00	6.52	2.18	1.71	1.31	1.35	1.15	2.50	1.30	1.26
13,	2.18	1.96	1.86	3.88	2.17	1.70	1.65	1.29	1.11	1.46	1.22	1.24
14,	2.02	1.64	2.68	3.18	2.18	1.67	1.41	1.27	1.05	1.36	1.21	1.22
15,	1.90	1.68	3.43	2.90	2.12	1.64	1.35	1.23	0.89	1.34	1.20	1.26
16,	2.06	1.62	3.04	6.70	2.13	1.63	1.30	1.17	0.79	1.30	1.94	1.26
17,	3.52	1.78	2.25	3.94	2.16	1.60	1.28	1.11	0.79	1.19	2.24	1.26
18,	2.50	1.76	2.06	3.24	2.24	1.58	1.27	1.09	1.07	1.10	1.68	1.26
19,	2.36	1.73	2.01	3.00	2.22	1.54	1.24	1.25	1.69	1.08	1.45	1.24
20,	2.20	1.74	3.86	2.80	2.18	1.52	1.22	1.11	1.38	1.62	1.36	1.20
21,	2.20	1.86	3.34	2.68	2.19	2.66	1.22	1.07	1.27	1.71	1.34	1.22
22,	2.21	2.02	2.52	2.64	2.23	1.69	1.23	1.06	1.71	1.38	1.24	1.28
23,	2.12	2.50	2.32	2.58	4.10	1.66	1.21	1.05	1.41	1.28	1.21	1.50
24,	2.46	1.94	2.26	2.52	3.48	1.74	1.19	1.05	1.35	1.23	1.21	2.48
25,	2.24	1.72	2.21	2.48	2.78	1.66	1.30	1.03	1.25	2.74	1.24	2.59
26,	2.10	1.64	2.23	2.46	2.42	1.63	1.18	1.02	1.19	2.44	1.22	4.98
27,	2.50	2.88	4.98	3.66	2.31	1.62	1.14	1.43	1.14	1.78	1.20	2.56
28,	2.44	3.30	3.66	7.40	3.96	1.72	1.12	1.31	1.11	1.38	1.44	1.64
29,	2.12	....	2.54	4.27	2.56	1.56	1.16	1.25	1.08	1.26	1.75	1.55
30,	2.10	....	2.40	3.50	2.22	1.52	1.32	1.51	1.07	1.29	1.60	1.48
31,	2.09	....	2.39	....	2.18	....	1.28	1.19	....	1.29	....	1.40

◆

SUSQUEHANNA BASIN

◆

NORTH BRANCH OF SUSQUEHANNA RIVER.

DESCRIPTION OF BASIN.

The North Branch of the Susquehanna river, which joins the West Branch at Northumberland to form the main Susquehanna river, drains a total area of 11,485 square miles, of which 6,270 lie in Pennsylvania, and 5,215 in New York State. This Branch rises in the Catskill Mountains, in southeastern New York, close to the headwaters of the Delaware river, flows in a general southwesterly course into Pennsylvania near the northeastern corner of the state, and, forming a loop about 16 miles in length, again enters New York state, where it continues westerly, finally turning southward into Pennsylvania, just north of Sayre, Bradford county, and follows a southeasterly course to Wilkes-Barre, and thence southwesterly to its junction with the West Branch. The total length of the river, to the forks at Oneonta, N. Y., is approximately 290 miles. From its headwaters to near where it crosses into Pennsylvania for the second time, this stream flows through a well populated, agricultural area, the mountains being fairly well covered with second growth timber, the channel lying in a narrow valley. Just above Sayre the river flows through a wide, open, thickly settled, farming country, but as it enters Pennsylvania it changes to a narrow valley, bounded by hills 400 to 600 feet high, and thus continues, passing now and then through broad flats, to its mouth.

The upper part of the watershed in Pennsylvania is thinly inhabited and not extensively farmed, the mountains being usually covered with second growth timber, but from the mouth of the Lackawanna river, 10 miles above Wilkes-Barre, to its mouth, the basin is densely settled. In this section lies the Wyoming Valley anthracite coal field. Four cities, Pittston, Scranton, Carbondale and Wilkes-Barre, many large boroughs and numerous farming and mining villages are found in this drainage area in Pennsylvania, besides which some cities and boroughs of New York State also lie in this watershed.

The slope of the stream in Pennsylvania is not steep, flowing, as it does, through a succession of rapids and pools, and follows a uniform rate of about two feet per mile to its mouth. All but a small portion of the basin, near the mouth, lies within the glacial area. The sub-basins, lying within the glacial area, abound in lakes, ponds and swamps, and a few of these basins are still well forested.

The principal tributaries in New York are the Chenango and Unadilla rivers, and in Pennsylvania the Chemung and Lackawanna rivers, Towanda, Wyalusing, Tunkhannock and Fishing creeks.

Numerous domestic water supplies are taken from tributaries of the North Branch and a few from the parent stream, which is also used to some extent for industrial purposes. Water power is developed only to a limited extent.

For many years the coal mining companies in this region have been dumping culm and refuse matter into the river and its tributaries.

The river is not used for navigation, being too shallow and swift.

Over the greater portion of this basin there is an average annual precipitation of 35 to 40 inches, while a small strip to the southeast of the stream, from Northumberland to Scranton, receives from 40 to 45 inches.

The flow has been measured at Conklin, N. Y., since November 13, 1912, at Binghamton, N. Y., from July 31, 1901, to December 31, 1912; at Wilkes-Barre, Pa., since March 30, 1899, 67 miles above the mouth; and at Danville, Pa., since March 25, 1899, 12 miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 1.

NORTH BRANCH SUSQUEHANNA RIVER AT CONKLIN, N. Y.

DESCRIPTION OF STATION.

LOCATION—On the highway bridge just below Conklin, N. Y., 8 miles above the mouth of the Chenango river entering from the right at Binghamton, N. Y.. and 5 miles below the mouth of Big Snake creek coming in from the left.

RECORDS AVAILABLE—Discharge complete from November 13, 1912, to December 31, 1913.

DRAINAGE AREA—2,350 square miles.

GAGE—A staff gage having vertical section is bolted to the left abutment of the bridge. Below this is an inclined gage flush with the bed of the stream. It is read by Daniel Ames.

DISCHARGE MEASUREMENTS—Made from the bridge at high and medium stages, and by wading at low stages.

CHANNEL—The bed consists of coarse gravel and boulders.

WINTER FLOW—The gage heights are affected by ice during extreme cold weather.

REMARKS—The data on this station have been furnished by the United States Geological Survey.

DISCHARGE MEASUREMENTS OF NORTH BRANCH SUSQUEHANNA RIVER, AT CONKLIN, N. Y.

(Drainage area 2350 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1912							
1	July 25	Weber, ...	164	320	1.13	2.10	361	.2 and .8 method.
2	Nov. 14	Weber, ...	361	2200	2.08	5.57	4570	.2 and .8 method.
	1913							
3	Mar. 14	Weber, ...	361	2650	2.88	6.93	7630	.2 and .8 metbod.
4	Mar. 15	Weber, ...	378	3470	3.78	9.07	13100	.2 and .8 method.
5	Mar. 28	Weber, ...	382	6970	6.52	18.20	51400	.2 and .8 method.
6	Mar. 31	Weber, ...	381	3530	3.71	9.10	13100	.2 and .8 method.
7	May 6	DeGolyer, ...	339	1470	0.90	3.50	1380	.2 and .8 method.
8	July 29	Canfield, ...	125	151	2.42	2.00	302	.2 and .8 method. Measurements made by wading 1000 ft. above gage.
9	Sept. 18	Barnes, ...	170	208	0.71	1.55	147	.2 and .8 method. Measurements made by wading 500 feet below gage.

DISCHARGE TABLE FOR NORTH BRANCH SUSQUEHANNA RIVER, AT CONKLIN, N. Y., FOR 1912 AND 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.50	134	.30	2390	.10	8035	.90	15490	.60	24820
.60	157	.40	2540	.20	8275	10.00	15800	.70	25210
.70	185	.50	2690	.30	8515	.10	16120	.80	25600
.80	218	.60	2845	.40	8755	.20	16440	.90	26000
.90	257	.70	3005	.50	9000	.30	16760	13.00	26400
2.00	303	.80	3165	.60	9245	.40	17080	.10	26810
.10	357	.90	3330	.70	9495	.50	17400	.20	27220
.20	413	5.00	3500	.80	9745	.60	17730	.30	27630
.30	471	.10	3675	.90	9995	.70	18060	.40	28050
.40	530	.20	3855	8.00	10250	.80	18390	.50	28470
.50	590	.30	4040	.10	10505	.90	18720	.60	28890
.60	652	.40	4230	.20	10760	11.00	19050	.70	29310
.70	718	.50	4430	.30	11015	.10	19390	.80	29740
.80	790	.60	4635	.40	11275	.20	19730	.90	30170
.90	866	.70	4845	.50	11535	.30	20070	14.00	30600
3.00	948	.80	5060	.60	11795	.40	20420	.10	31030
.10	1034	.90	5275	.70	12055	.50	20770	.20	31460
.20	1122	6.00	5495	.80	12320	.60	21120	.30	31900
.30	1212	.10	5715	.90	12585	.70	21470	.40	32340
.40	1304	.20	5940	9.00	12850	.80	21830	.50	32780
.50	1400	.30	6170	.10	13120	.90	22190	.60	33220
.60	1500	.40	6400	.20	13400	12.00	22550	.70	33660
.70	1605	.50	6630	.30	13680	.10	22920	.80	34100
.80	1720	.60	6860	.40	13970	.20	23290	.90	34550
.90	1840	.70	7095	.50	14270	.30	23670	15.00	35000
4.00	1970	.80	7330	.60	14570	.40	24050		
.10	2105	.90	7565	.70	14870	.50	24430		
.20	2245	7.00	7800	.80	15180				

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF NORTH BRANCH SUSQUEHANNA RIVER AT CONKLIN, N. Y.

1912.	NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.
1,	......	......	4.3	2390
2,	......	......	5.1	3680
3,	......	......	8.5	11500
4,	......	......	8.1	10500
5,	......	......	7.0	7800
6,	......	......	7.0	7800
7,	......	......	7.2	8280
8,	......	......	6.6	6860
9,	......	......	5.9	5280
10,	......	......	5.3	4040
11,	......	......	5.0	3500
12,	......	......	5.0	3500
13,	5.5	4430	4.6	2840
14,	5.5	4430	4.3	2390
15,	5.4	4230	4.4	2540
16,	5.3	4040	4.4	2540
17,	5.0	3500	4.4	2540
18,	4.8	3160	4.3	2390
19,	4.7	3000	5.0	3500
20,	4.6	2840	6.4	6400
21,	4.4	2540	5.7	4840
22,	4.4	2540	5.0	3500
23,	4.2	2240	4.7	3000
24,	4.2	2240	4.8	3160
25,	4.4	2540	4.6	2840
26,	4.7	3000	4.5	2690
27,	4.8	3160	4.4	2540
28,	4.7	3000	4.4	2540
29,	4.6	2840	4.2	2240
30,	4.4	2540	4.4	2540
31,	......	......	5.2	3860

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF NORTH BRANCH SUSQUEHANNA RIVER AT CONKLIN, N. Y.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC,	
DAY	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	6.1	5720	5.8	5060	6.8	7330	9.0	12800	4.3	2390	4.9	3330	2.5	590	1.88	249	1.50	134	1.72	192	2.85	828	4.5	2690
2, ...	5.6	4640	5.8	5060	6.8	7330	8.1	10500	4.0	1970	4.6	2840	2.45	560	1.88	249	1.50	134	1.82	226	2.8	790	4.4	2540
3, ...	6.0	5500	4.6	2840	5.8	5060	7.4	8800	3.8	1720	4.3	2390	2.4	530	1.85	238	1.62	163	1.88	249	2.8	790	4.3	2390
4, ...	8.6	11800	4.7	3000	5.0	3500	6.9	7600	3.7	1600	4.3	2390	2.4	530	1.85	238	1.65	171	1.82	226	2.65	685	4.2	2240
5, ...	8.3	11000	4.7	3000	5.0	3500	7.9	10000	3.6	1500	4.0	1970	2.4	530	1.90	257	1.65	171	1.69	182	2.65	685	4.2	2240
6, ...	7.2	8280	4.4	2540	4.9	3330	6.6	6860	3.5	1400	3.8	1720	2.35	500	1.85	238	1.65	171	1.75	202	2.65	685	4.1	2100
7, ...	8.6	11800	*	......	....	3160	6.3	6170	3.5	1400	3.7	1600	2.4	530	1.82	226	1.56	148	1.85	238	2.6	652	4.1	2100
8, ...	13.0	26400	....	......	....	3000	6.0	5500	3.4	1300	3.6	1500	2.35	500	1.82	226	1.66	174	1.91	262	2.5	590	4.6	2840
9, ...	13.5	28500	....	......	....	2840	5.7	4840	3.35	1260	3.6	1500	2.3	471	1.82	226	1.65	171	1.86	241	3.0	948	4.0	1970
10, ...	9.8	15200	....	......	4.6	2840	5.4	4230	3.3	1210	3.5	1400	2.35	500	1.80	218	1.65	171	1.91	262	7.1	8040	4.7	3000
11, ...	8.1	10500	....	......	6.0	5500	5.3	4040	3.25	1170	3.5	1400	2.35	500	1.82	226	1.61	160	1.86	241	7.6	9240	4.5	2690
12, ...	9.2	13400	....	......	6.4	6400	6.1	5720	3.1	1030	3.25	1170	2.3	471	1.75	202	1.62	163	1.86	241	6.3	6170	4.4	2540
13, ...	9.4	14000	....	......	6.1	5720	6.4	6400	2.95	907	3.15	1080	2.15	385	1.75	202	1.60	157	1.85	238	5.4	4230	4.3	2390
14, ...	7.5	9000	....	......	6.6	6860	6.0	5500	2.9	866	3.15	1080	2.15	385	1.72	192	1.64	168	1.85	238	5.1	3680	4.3	2390
15, ...	6.8	7330	....	......	8.8	12300	5.7	4840	2.9	866	3.0	948	2.2	413	1.75	202	1.42	120	1.82	226	5.3	4040	4.3	2390
16, ...	6.5	6630	....	......	9.3	13700	5.4	4230	2.9	866	2.85	828	2.15	385	1.75	202	1.32	106	1.88	249	5.3	4040	4.3	2390
17, ...	6.8	7330	....	......	8.3	11000	5.2	3860	2.9	866	2.65	685	2.05	330	1.72	192	1.55	146	1.89	253	5.1	3680	4.2	2240
18, ...	8.6	11800	....	......	6.8	7330	4.9	3330	2.8	790	2.6	652	....	314	1.62	163	1.52	139	1.88	249	5.0	3500	4.1	2100
19, ...	9.6	11600	....	......	6.1	5720	4.7	3000	2.9	866	2.6	652	....	294	1.70	185	1.58	152	1.92	266	4.8	3160	4.0	1970
20, ...	9.0	12800	....	......	6.5	6630	4.6	2840	2.8	790	2.5	590	....	285	1.65	171	1.55	146	2.2	413	4.7	3000	3.9	1840
21, ...	8.5	11500	....	......	6.7	7100	4.5	2690	2.75	754	2.6	652	....	275	1.65	171	1.62	163	4.2	2240	5.4	4230	3.7	1600
22, ...	8.5	11500	....	......	7.6	9240	4.3	2390	2.8	790	2.5	590	....	271	1.75	202	2.6	652	4.2	2240	5.3	4040	3.7	1600
23, ...	7.0	7800	....	......	7.1	8040	4.2	2240	3.0	948	2.7	718	....	266	1.68	179	2.3	471	3.8	1720	4.9	3330	3.7	1600
24, ...	7.3	8520	....	......	6.6	6860	4.2	2240	4.0	1970	2.6	652	....	257	1.72	192	2.2	413	3.5	1400	4.7	3000	4.3	2390
25, ...	7.5	9000	....	......	7.2	8280	4.0	1970	4.8	3160	2.65	685	....	249	1.58	152	2.0	303	3.15	1080	4.6	2840	4.0	1970
26, ...	6.9	7560	....	......	10.6	17700	4.0	1970	4.4	2540	2.6	652	....	245	1.60	157	1.96	285	3.15	1080	4.6	2840	4.0	1970
27, ...	6.4	6400	....	......	15.7	38200	3.9	1840	4.0	1970	2.5	590	....	245	1.75	202	1.92	266	3.2	1120	4.5	2690	4.0	1970
28, ...	6.2	5940	....	......	18.2	51400	4.6	2840	4.2	2240	2.55	621	....	241	1.68	179	1.90	257	3.15	1080	4.4	2540	3.6	1500
29, ...	5.7	4840	....	......	17.0	45000	4.6	2840	5.9	5280	2.5	590	1.88	249	1.70	185	1.84	234	3.15	1080	4.3	2390	3.3	1210
30, ...	4.8	3160	....	......	12.4	24000	4.4	2540	6.7	7100	2.55	621	1 82	226	1.55	146	1.72	192	3.05	991	4.4	2540	3.7	1600
31, ...	5.3	4040	....	......	9.4	14000	....	......	5.7	4840	....	......	1.82	226	1.50	134	....	......	2.95	907	....	......	3.8	1720

*River frozen Feb. 7-28, discharge estimated from hydrograph and comparative studies. Discharge March 7-9, inclusive, interpolated. No observations taken **July 18-28 inclusive, and discharge computed from W. B. gage heights at Binghamton and comparison with preceding estimates.**

ESTIMATED MONTHLY DISCHARGE OF NORTH BRANCH SUSQUEHANNA RIVER, AT CONKLIN, N. Y.

(Drainage area 2350 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1912.					
November,	4430	2240	3130	1.33	.89
December,	11500	2240	4320	1.84	2.12
*1913.					
January,	28500	3160	10100	4.30	4.96
February,	....	....	2790	1.20	1.25
March,	51400	2840	11400	4.85	5.59
April,	12800	1840	4820	2.05	2.29
May,	7100	754	1820	.774	.89
June,	3330	590	1200	.511	.57
July,	590	226	379	.161	.19
August,	249	134	200	.085	.10
September,	652	106	210	.089	.10
October,	2240	182	640	.272	.31
November,	9240	590	3000	1.28	1.43
December,	3000	1210	2130	.910	1.05
The year,	51400	106	3240	1.38	18.73

*Discharge Feb. 7 to 28 inclusive, estimated from hydrograph and comparative studies.

CHENANGO RIVER.

DESCRIPTION OF BASIN.

Chenango river rises in the central part of Madison county, New York, and flows southward into the Susquehanna river at Binghamton, N. Y. It is approximately seventy miles long and its drainage area comprises about 1,580 square miles. Its headwater valleys lie at an elevation of about 1,200 feet above sea level, and its mouth is 864 feet above tide. Its bed is, as a rule, composed of sand and gravel and the stream is bordered, in many places, by bottom land, subject to overflow. A portion of the headwaters are diverted across the Chenango-Mohawk Divide, through Oriskany creek, to feed the summit level of the Erie Canal.

Considerable power is developed at Binghamton and at Port Dickinson, three miles above.

The mean annual precipitation over this water shed is from 35 to 40 inches.

The discharge of this stream was measured from July 31st, 1901, to December 31st, 1911, at Binghamton, N. Y., near its mouth, although several discharge measurements were obtained during 1912. Since November 11, 1912, the discharge has been measured at Chenango Forks, N. Y.

SUSQUEHANNA BASIN—STATION NO. 2.

CHENANGO RIVER, NEAR CHENANGO FORKS, NEW YORK.

DESCRIPTION OF STATION.

LOCATION—On highway bridge two miles below Chenango Forks Post Office, 1.5 miles below the mouth of Tioughnioga river (coming in from the right) and 12 miles above the mouth of river at Binghamton, N. Y.

RECORDS AVAILABLE—Discharge measurements and gage heights from November 11, 1912, to December 31, 1913.

DRAINAGE AREA—1,420 square miles.

GAGE—Inclined staff gage on left bank. The gage is read by Erastus Ingraham.

DISCHARGE MEASUREMENTS—Low water measurements made by wading near the gage.

CHANNEL—One channel at all stages; bed of stream small cobbles, filled in with sand and gravel; not liable to shift; current uniform across the entire section.

WINTER FLOW—Gage heights somewhat effected by ice during ordinary winters.

REMARKS—This station was established to supercede the station on the Chenango river, at Binghamton, N. Y., which station was influenced by backwater from the North Branch of the Susquehanna river. The data on this station has been furnished by the United States Geological Survey, who maintain and operate this station.

DISCHARGE MEASUREMENTS OF CHENANGO RIVER, NEAR CHENANGO FORKS, N. Y.

(Drainage area 1420 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
1	March 17	Weber,	532	1450	4.06	6.00	5880	.2 & .8 method. Measurement is combined flows of Tioughnioga and Chenango rivers measured just above their confluence in Chenango Forks and about one mile above gages.
2	May 5	DeGolyer,	407	540	1.34	3.18	722	.2 & .8 method. Measurement made by wading 150′ below gage.
3	Aug. 6	Canfield,	180	133	1.06	2.35	141	.2 & .8 method. Msmt. made by wading 450′ below gage.
4	Sept. 17	Barnes,	180	127	1.03	2.28	139	.2 & .8 method. Msmt. made by wading 450′ below gage.
5	Oct. 29	Barnes,	310	681	0.98	3.12	670	.2 & .8 method.

DAILY MEAN GAGE HEIGHTS OF CHENANGO RIVER NEAR CHENANGO FORKS, N. Y.

1912.	NOV.	DEC.	1912.	NOV.	DEC.
DAY.	G. H.	G. H.	DAY.	G. H.	G. H.
1,	....	4.0	16,	4.3	3.5
2,	....	4.1	17,	4.2	3.5
3,	....	7.2	18,	4.0	3.4
4,	....	7.3	19,	4.0	4.3
5,	....	6.3	20,	4.0	5.0
6,	....	7.0	21,	4.0	5.2
7,	....	7.0	22,	4.0	4.9
8,	....	6.0	23,	4.0	4.2
9,	....	5.0	24,	3.5	4.0
10,	....	4.4	25,	3.75	4.0
11,	5.2	4.2	26,	4.0	3.95
12,	4.0	4.1	27,	4.0	4.0
13,	4.1	4.0	28,	4.0	3.85
14,	4.2	3.4	29,	4.0	3.85
15,	4.2	4.0	30,	4.0	3.95
			31,	....	4.8

DAILY MEAN GAGE HEIGHTS OF CHENANGO RIVER NEAR CHENANGO FORKS, N. Y.

1913.	JAN.	FEB.	MAR.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	4.9	4.8	....	6.4	3.45	4.8	2.68	2.42	2.30	2.40	3.1	4.0
2,	4.4	4.4	....	5.8	3.4	3.7	2.60	2.38	2.30	2.42	2.95	3.8
3,	5.2	4.3	....	5.3	3.2	3.55	2.68	2.35	2.30	2.42	2.94	3.6
4,	8.4	4.2	....	5.2	3.2	3.45	2.65	2.40	2.35	2.38	2.85	3.5
5,	6.8	4.2	....	5.2	3.2	3.4	2.65	2.40	2.35	2.40	2.92	3.5
6,	6.8	3.9	....	5.1	3.15	3.25	2.65	2.35	2.35	2.45	2.95	3.4
7,	8.6	3.45	....	4.8	3.1	3.25	2.65	2.32	2.30	2.42	2.88	3.4
8,	10.1	3.45	....	4.7	3.1	3.3	2.65	2.30	2.30	2.45	2.80	3.7
9,	9.0	3.25	....	4.6	3.05	3.2	2.65	2.32	2.30	2.48	2.92	4.2
10,	6.9	3.25	5.6	4.4	3.0	3.3	2.65	2.35	2.22	2.32	4.0	3.7
11,	6.3	3.1	7.3	4.6	3.0	3.3	2.60	2.3	2.20	2.38	5.1	3.65
12,	8.3	....	7.1	5.4	3.0	3.0	2.60	2.3	2.20	2.35	4.9	3.7
13,	7.4	....	5.7	5.1	3.0	2.90	2.68	2.35	2.20	2.48	5.6	3.4
14,	6.2	....	7.2	4.8	2.91	2.80	2.60	2.40	2.28	2.48	5.0	3.6
15,	5.8	....	7.9	4.6	2.75	2.86	2.62	2.28	2.20	2.40	4.2	3.9
16,	5.6	....	7.8	4.5	2.76	2.85	2.55	2.30	2.20	2.45	3.95	3.6
17,	6.5	....	6.2	4.3	2.90	2.81	2.50	2.30	2.22	2.34	4.1	3.6
18,	8.0	....	5.4	4.1	2.92	2.80	2.50	2.28	2.32	2.42	3.95	3.6
19,	8.2	....	5.3	4.0	2.94	2.80	2.48	2.25	2.40	2.48	3.8	3.45
20,	7.0	....	6.3	3.95	2.91	2.80	2.46	2.22	2.48	2.58	3.75	3.3
21,	7.0	....	6.0	3.8	2.92	2.82	2.52	2.20	2.58	3.5	3.9	3.2
22,	6.3	....	6.4	3.65	2.98	2.82	2.52	2.25	2.72	3.8	4.3	3.4
23,	5.6	....	5.4	3.6	3.35	2.80	2.51	2.35	2.68	3.8	4.1	3.55
24,	6.0	....	5.2	3.6	4.4	2.80	2.50	2.32	2.58	3.7	4.3	3.85
25,	5.7	....	6.9	3.6	3.9	2.75	2.52	2.35	2.50	3.5	4.2	3.9
26,	5.2	....	10.8	3.55	3.5	2.75	2.50	2.32	2.55	3.4	3.9	3.8
27,	5.2	....	13.4	3.4	3.55	2.80	2.42	2.35	2.50	3.3	3.8	3.5
28,	4.8	....	11.8	3.4	3.75	2.70	2.45	2.35	2.50	3.3	3.6	3.3
29,	4.6	....	9.0	3.4	4.8	2.80	2.45	2.35	2.50	3.2	3.7	3.4
30,	4.2	....	7.4	3.5	4.7	2.80	2.45	2.35	2.50	3.1	3.9	3.6
31,	4.6	....	6.6	....	4.2	....	2.48	2.35	....	3.05	....	2.7

CHEMUNG RIVER.

DESCRIPTION OF BASIN.

The Chemung river is formed near Painted Post, in the southeastern part of Steuben county, N. Y., by the confluence of Cohocton and Tioga rivers. Cohocton river, the north branch, drains the opposite or southern slope of the divide at the head of Keuka and Canadaigua Lakes. Its drainage area lies wholly in the State of New York, principally in Steuben county and comprises approximately 630 square miles above the mouth. Tioga river rises in Tioga county, Penn'a, and flows northward, crossing the state line near Lawrenceville, Penn'a. The last fifteen miles of its course lie in New York State. It has about 1,330 square miles of drainage area above its mouth, 689 of which lie in Penn'a. About five miles from its mouth the Tioga river receives, from the left, Canisteo river, which rises in the northeast corner of Allegheny county, N. Y., and flows in a southeasterly direction, draining, with its tributaries, the southern part of Steuben county. Its drainage area comprises about 540 square miles.

The Chemung river flows southeastward through Corning, Elmira and Chemung, crosses the state line and flows for approximately two and one-half miles in Penn'a, returns to New York for approximately two and one-half miles, and crosses again to Penn'a near Waverly, emptying into the Susquehanna river near Athens, Bradford county, Penn'a. The total length of the river proper is about forty miles, of which thirty miles lie in New York; the drainage area at the mouth being approximately 2,520 square miles, 832 of which are in Pennsylvania.

The Chemung river is sluggish throughout its course, flowing over a wide, gravelly bed, in a series of rifts and pools, and one or the other of the banks is usually low and subject to frequent overflow. The hills bordering the river rise to a height of several hundred feet on either side, within a short distance of the stream. The upland plateau is, to a large extent, wooded, has impervious soil, no lake storage and few marsh areas. Tributaries are ramifying and uniformly distributed, though not very numerous, and dry gullies, or flood channels, are common. The principal tributaries in Pennsylvania are Seely creek, South creek and Bently creek, all of which join the river in New York State.

In its watershed in Pennsylvania lie the boroughs of Athens, Sayre and South Waverly, while in New York are Corning, Elmira, Chemung and Waverly.

The mean annual precipitation over this watershed is from 35 to 40 inches.

The discharge of this stream has been measured since September 7, 1903, at Chemung, approximately 10 miles above its mouth.

SUSQUEHANNA BASIN—STATION NO. 3.

CHEMUNG RIVER AT CHEMUNG, NEW YORK.

DESCRIPTION OF STATION.

LOCATION—On two span, steel structure, midway between Chemung, N. Y. and Willawanna, Pa., near the State Line.

RECORDS AVAILABLE—Discharge complete from September 7, 1903, to December 31, 1913.

DRAINAGE AREA—2,440 square miles.

GAGE—A tape and weight gage is attached to the upstream side of the bridge near the right bank. The elevation of zero is arbitrary. The length of tape is 29.58 feet. Bench Mark No. 1 is formed by three nails driven into a telegraph pole 70 feet to the right of the initial point for soundings, about 30 feet upstream; the pole is marked with black paint "U. S. G. S. B. M." elevation 29.88 feet above gage datum. The gage is read by D. L. Orcutt.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is face of right abutment, downstream side.

CHANNEL—The channel above and below the station is straight for 700 feet and 800 feet respectively. The right bank is high, cleared and not subject to overflow. The left bank is of medium height, wooded and overflows during extreme high stages. The bed is composed of gravel.

REMARKS—The smooth water reaches of the stream become ice covered in winter while needle ice forms over the rapids and is carried under the surface ice. The following data have been furnished by the United States Geological Survey:

DISCHARGE MEASUREMENTS OF CHEMUNG RIVER, AT CHEMUNG, NEW YORK.

(Drainage area 2440 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
40	March 18	Weber, ...	262	1310	1.96	4.31	2550	0.2 & 0.8 method.
41	May 2	DeGolyer, ...	304	1870	3.01	5.78	5620	0.2 & 0.8 method.
42	May 3	DeGolyer, ...	301	1750	2.53	5.34	4420	0.2 & 0.8 method.
43	Aug. 1	Canfield, ...	205	242	0.74	1.90	180	Measurement made by wading 1000 feet below gage, 0.2 & 0.8 method.

DISCHARGE TABLE FOR CHEMUNG RIVER, AT CHEMUNG, N. Y., FROM JAN. 13, 1911.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.40	39	4.00	2020	.60	7570	.20	16000	.80	27000
.50	53	.10	2160	.70	7840	.30	16400	.90	27500
.60	75	.20	2310	.80	8120	.40	16800	12.00	28000
.70	105	.30	2470	.90	8410	.50	17200	.10	28500
.80	140	.40	2630	7.00	8700	.60	17600	.20	29000
.90	180	.50	2800	.10	9000	.70	18000	.30	29500
2.00	220	.60	2980	.20	9300	.80	18400	.40	30000
.10	270	.70	3170	.30	9600	.90	18800	.50	30500
.20	320	.80	3360	.40	9900	10.00	19200	.60	31000
.30	370	.90	3560	.50	10200	.10	19600	.70	31500
.40	430	5.00	3760	.60	10500	.20	20000	.80	32000
.50	490	.10	3960	.70	10800	.30	20400	.90	32500
.60	550	.20	4180	.80	11100	.40	20800	13.00	33000
.70	620	.30	4400	.90	11400	.50	21200	.10	33500
.80	690	.40	4620	8.00	11800	.60	21600	.20	34000
.90	770	.50	4840	.10	12100	.70	22000	.30	34500
3.00	860	.60	5060	.20	12500	.80	22400	.40	35000
.10	960	.70	5300	.30	12800	.90	22900	.50	35500
.20	1060	.80	5550	.40	13200	11.00	23400	.60	36000
.30	1160	.90	5800	.50	13500	.10	23800	.70	36500
.40	1270	6.00	6050	.60	13800	.20	24200	.80	37000
.50	1380	.10	6300	.70	14200	.30	24600	.90	37500
.60	1500	.20	6550	.80	14500	.40	25000	14.00	38000
.70	1620	.30	6800	.90	14900	.50	25500		
.80	1750	.40	7050	9.00	15200	.60	26000		
.90	1880	.50	7300	.10	15600	.70	26500		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF CHEMUNG RIVER AT CHEMUNG, N. Y.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	3.9	1880	4.2	2310	4.6	2980	6.4	7050	7.0	8700	4.3	2470	2.55	520	1.91	184	1.70	105	1.76	126	3.5	1380	3.2	1060
2, ...	3.8	1750	3.8	1750	4.8	3360	5.6	5060	6.0	6050	3.9	1880	2.41	436	1.88	172	1.73	116	1.85	160	3.3	1160	3.1	960
3, ...	4.6	2980	3.2	1060	3.8	1750	5.2	4180	5.3	4400	3.7	1620	2.30	370	1.82	148	1.78	133	2.35	400	3.15	1010	3.1	960
4, ...	11.1	23800	3.5	1380	3.4	1270	5.6	5060	4.8	3360	3.5	1380	2.26	350	1.85	160	1.75	122	2.25	345	3.05	910	3.05	910
5, ...	6.9	8410	3.4	1270	3.3	1160	5.4	4620	4.4	2630	3.3	1160	2.41	454	1.83	152	1.72	112	2.14	290	2.9	770	2.9	770
6, ...	5.9	5800	3.2	1060	3.2	1060	5.3	4400	4.2	2310	3.15	1010	2.42	442	1.86	164	1.72	112	2.08	260	2.85	730	2.9	770
7, ...	7.3	9600	*	......	3.0	860	5.0	3760	4.0	2020	3.05	910	2.36	406	1.82	148	1.70	105	2.00	220	2.75	655	2.85	730
8, ...	9.0	15200	....	......	2.95	815	4.8	3360	3.8	1750	3.0	860	2.28	360	1.82	148	1.66	93	1.96	204	2.75	655	2.95	815
9, ...	10.2	20000	....	......	3.0	860	4.6	2980	3.6	1500	3.05	910	2.23	335	2.05	245	1.69	102	1.94	196	3.4	1270	3.2	1060
10, ...	6.6	7570	....	......	4.6	2980	4.4	2630	3.5	1380	2.95	815	2.27	355	1.94	196	1.66	93	1.91	184	10.6	21600	2.95	815
11, ...	6.1	6300	....	......	4.8	3360	4.4	2630	3.4	1270	2.85	730	2.18	310	1.89	176	1.66	93	1.86	164	6.7	7840	2.5	490
12, ...	7.1	9000	....	......	5.2	4180	4.9	3560	3.25	1110	2.75	655	2.31	394	1.81	141	1.66	93	1.90	180	5.3	4400	2.75	655
13, ...	7.4	9900	....	......	4.2	2310	4.6	2980	3.2	1060	2.7	620	2.26	350	1.86	164	1.64	87	1.88	172	4.8	3360	2.8	690
14, ...	5.7	5300	....	......	4.8	3360	4.4	2630	3.1	960	2.65	585	2.22	330	1.79	136	1.64	87	2.07	255	4.8	3360	2.95	815
15, ...	5.3	4100	....	......	6.9	8410	4.3	2470	3.05	910	2.55	520	2.19	345	1.78	133	1.60	75	2.07	255	5.2	4180	2.9	770
16, ...	5.0	3760	....	......	6.7	7840	4.2	2310	3.05	910	2.55	520	2.19	315	1.80	140	1.59	73	2.06	250	4.7	3170	2.9	770
17, ...	5.9	5800	....	......	5.2	4180	4.0	2020	2.95	815	2.45	460	2.16	300	1.80	140	1.60	75	1.92	188	4.7	3170	2.85	730
18, ...	8.1	12100	....	......	4.4	2630	3.8	1750	2.9	770	2.42	442	2.12	280	1.84	156	1.62	81	1.91	184	4.5	2800	2.8	690
19, ...	8.3	12800	....	......	4.1	2160	3.6	1500	2.9	770	2.38	418	2.10	270	1.76	126	1.69	102	1.89	176	4.2	2310	2.75	675
20, ...	6.6	7570	....	......	4.1	2160	3.6	1500	2.8	690	2.46	466	2.06	250	1.73	116	1.66	93	2.29	365	4.1	2160	2.6	550
21, ...	6.9	8410	....	......	4.4	2630	3.45	1320	2.75	655	2.46	466	2.06	250	1.71	108	1.70	105	3.7	1620	4.0	2020	2.7	620
22, ...	6.4	7050	....	......	4.7	3170	3.35	1220	2.75	655	2.55	520	2.04	240	1.70	105	2.02	230	3.9	1880	3.9	1880	2.7	620
23, ...	5.5	4840	....	......	4.4	2630	3.3	1160	2.9	770	2.65	585	2.02	230	1.75	122	2.40	430	3.25	1110	3.7	1620	2.65	585
24, ...	5.9	5800	....	......	4.2	2310	3.45	1320	3.7	1620	2.55	520	2.08	260	1.74	119	2.37	412	2.95	815	3.6	1500	3.1	960
25, ...	5.9	5800	....	......	6.9	8410	3.60	1560	4.2	2310	2.46	466	2.15	295	1.68	99	2.14	290	2.85	730	3.45	1320	3.8	1750
26, ...	5.2	4180	....	......	14.2	39000	3.4	1270	3.8	1750	2.9	770	2.10	270	1.76	126	2.04	240	5.0	3760	3.4	1270	3.7	1660
27, ...	5.0	3760	....	......	16.2	49000	3.3	1160	3.8	1750	3.2	1060	2.06	250	1.74	119	1.96	204	7.1	9900	3.25	1110	3.1	960
28, ...	4.8	3360	....	......	11.9	42500	10.0	19200	5.9	5800	3.1	960	2.06	250	1.70	105	1.84	156	5.2	4180	3.2	1060	3.1	960
29, ...	4.3	2470	....	......	9.2	16000	13.9	37500	8.0	11800	2.85	730	2.02	230	1.74	119	1.86	164	4.4	2630	3.15	1010	3.15	1010
30, ...	4.1	2160	....	......	7.5	10200	9.0	15200	5.7	5300	2.65	585	2.00	220	1.76	126	1.74	119	4.0	2020	3.15	1010	3.2	1060
31, ...	4.1	2160	....	......	6.6	7570	......	......	4.8	3360	....	......	1.95	200	1.76	126	....	......	3.7	1620	......	......	3.25	1110

*River frozen Feb. 7-28 incl. and discharge estimated from hydrograph and comparative studies.

ESTIMATED MONTHLY DISCHARGE OF CHEMUNG RIVER, AT CHEMUNG, N. Y.

(Drainage area 2440 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	23800	1750	7220	2.96	3.41
February,	....	....	1080	0.443	0.46
March,	49000	815	7780	3.19	3.68
April,	37500	1160	4910	2.01	2.24
May,	11800	655	2550	1.05	1.21
June,	2470	418	836	0.343	0.38
July,	520	200	317	0.130	0.15
August,	245	99	143	0.058	0.07
September,	430	73	143	0.058	0.06
October,	9900	126	1120	0.459	0.53
November,	21600	655	2690	1.10	1.23
December,	1750	490	868	0.356	0.41
The year,	....	....	2470	1.013	13.83

Note.—River frozen Feb. 7-28 incl. and discharge estimated from hydrograph and comparative studies.

WYALUSING CREEK.

DESCRIPTION OF BASIN.

Wyalusing creek, a tributary of the North Branch of the Susquehanna river, in Susquehanna and Bradford counties, drains approximately 215 square miles. Rising in three branches, the headwaters of which spread over the central and western parts of Susquehanna county, and join near Rushland near the Susquehanna-Bradford county line, it follows a general southwesterly course to its mouth at Wyalusing, Bradford county, a distance of approximately 30 miles. The basin is sparsely inhabited, the habitations being scattered over the agricultural section and in small villages, the watershed consisting of hilly, farming country, containing little timber except on the hilltops. The principal tributaries are the North, Middle and East Branches, which form its headwaters, and include a number of lakes in their watersheds. This creek lies entirely within the glacial area, the slope being gradual throughout most of its course. Wyalusing creek is used to a limited extent for power purposes.

The mean annual precipitation over this watershed is from 35 to 40 inches.

The discharge of this stream has been measured since October 28, 1908, at Wyalusing, 2½ miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 4.

WYALUSING CREEK AT WYALUSING, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge; first bridge after leaving Wyalusing, Bradford county.

RECORDS AVAILABLE—Discharge complete December 1 to 31, 1908; January 1 to 3, 1909, and June 1, 1909 to December 31, 1913.

DRAINAGE AREA—214 square miles.

GAGE—A standard chain gage is fastened to the downstream handrail of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of weight to the marker is 21.73 feet. Bench Mark No. 1 is a projection on stone in bottom course, left abutment, upstream wing, second stone in from face of abutment, one foot from first vertical joint from face of abutment, elevation 5.512 feet above gage datum. The gage is read once daily by Alton S. Taylor.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the highway bridge, and by wading at low stages. The initial point for soundings is top edge of east abutment, downstream side.

CHANNEL—The channel is straight for 1,000 feet above and below the station. The right bank is high and not subject to overflow, while the left bank is low and water passes around the bridge at high stages. There is an abandoned head race to the left of the bridge through which water passes above gage height 2.9 feet. The bed of the stream is composed of rocks and gravel.

REMARKS—There are several mills on the stream above the bridge which affect the flow during dry weather.

DISCHARGE MEASUREMENTS OF WYALUSING CREEK, AT WYALUSING, BRADFORD COUNTY, PA.

(Drainage area 214 square miles.)

No.	Date.		Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
30	Aug.	6	Reckord, ...	29	17	0.46	0.05	7.8	Wading msmt. 150′ above bridge.
31	Dec.	10	Boehringer, ...	115	126	1.14	0.94	144	0.6 method.

DISCHARGE TABLE FOR WYALUSING CREEK, AT WYALUSING, BRADFORD COUNTY, FROM JAN. 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
—0.20	2	.10	186	.40	854	.70	2024	5.00	3335
—0.10	4	.20	220	.50	932	.80	2122	5.50	3880
0.00	6	.30	256	.60	1016	.90	2220	6.00	4460
.10	10	.40	296	.70	1100	4.00	2318	6.50	5060
.20	18	.50	340	.80	1186	.10	2415	7.00	5700
.30	26	.60	384	.90	1276	.20	2515	7.50	6360
.40	38	.70	432	3.00	1366	.30	2615	8.00	7100
.50	52	.80	482	.10	1456	.40	2715	8.50	7900
.60	68	.90	534	.20	1550	.50	2815	9.00	8700
.70	86	2.00	592	.30	1644	.60	2915	10.00	10300
.80	106	.10	652	.40	1738	.70	3015	11.00	11900
.90	130	.20	714	.50	1832	.80	3120		
1.00	156	.30	780	.60	1926				

Note.—This table is only applicable subsequent to Jan 1, 1913, and is based on two measurements made in 1913, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF WYALUSING CREEK AT WYALUSING, BRADFORD COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	1.60	384	1.82	492	2.30	780	2.03	610	1.56	366	1.04	168	0.35	32	0.18	16	0.11	11	0.19	17	0.65	77	0.82	111
2, ...	1.38	288	0.89	128	1.99	586	1.55	362	1.33	268	0.93	138	0.33	30	0.08	9	0.10	10	0.19	17	0.62	72	0.82	111
3, ...	3.09	1450	1.12	193	1.15	263	1.42	305	1.18	213	0.81	108	0.28	24	0.06	8	0.05	8	0.23	20	0.58	65	0.79	104
4, ...	2.69	2010	1.02	162	1.49	336	1.60	384	1.06	174	0.71	88	0.25	22	0.08	9	0.01	6	0.37	31	0.48	49	0.75	96
5, ...	2.54	966	1.18	213	1.48	331	1.48	331	0.99	153	0.61	70	0.23	20	0.01	6	0.02	7	0.43	42	0.51	54	0.72	90
6, ...	2.10	652	1.23	231	1.27	245	1.37	284	0.97	148	0.58	65	0.25	22	0.06	8	0.02	7	0.21	21	0.46	46	0.70	86
7, ...	2.34	1680	0.93	138	0.82	111	1.32	264	0.88	125	0.48	49	0.16	15	0.12	12	—0.02	6	0.26	23	0.48	49	0.70	86
8.	a4.79	3110	1.05	171	1.27	215	1.36	280	0.75	96	0.63	73	0.14	13	0.07	9	0.03	7	0.23	20	0.43	42	1.40	296
9, ...	3.22	1570	1.06	174	0.95	143	1.20	220	0.77	100	0.60	68	0.16	15	0.03	7	0.00	6	0.19	17	0.54	58	1.02	162
10, ...	2.39	847	1.01	159	1.36	280	1.09	183	0.70	86	0.46	46	0.26	23	0.07	9	e0.20	2	0.23	20	4.01	2330	0.89	128
11, ...	2.38	839	1.06	174	1.62	394	1.08	180	0.64	75	0.43	42	0.28	24	0.05	8	e—0.20	2	0.17	16	2.30	780	0.91	133
12, ...	3.14	1490	0.98	151	1.61	389	1.97	575	0.61	70	0.41	39	0.21	19	0.03	7	0.00	6	0.25	22	1.77	467	0.80	106
13, ...	2.28	767	*	70	1.62	394	1.50	340	0.60	68	0.37	34	0.20	18	0.01	6	0.02	7	0.21	19	1.54	358	0.99	153
14.	1.91	540	......	70	2.15	1500	1.70	432	0.54	58	0.37	34	0.21	19	0.01	6	—0.02	6	0.30	26	1.44	314	0.90	130
15, ...	1.77	467	......	70	3.29	1630	1.47	327	0.53	57	0.32	28	0.28	24	0.00	6	e—0.20	2	0.33	30	1.72	442	0.88	125
16, ...	1.69	427	......	70	3.10	1460	1.32	264	0.54	58	0.28	24	0.28	24	—0.01	6	e—0.20	2	0.25	22	1.44	314	0.83	113
17, ...	1.96	569	......	70	2.25	747	1.21	224	0.54	58	0.30	26	0.27	24	—0.02	6	e—0.20	2	0.19	17	1.84	503	0.78	102
18, ...	2.37	832	......	70	1.73	447	1.09	183	0.51	54	0.28	24	0.18	16	0.03	7	e—0.20	2	0.27	24	1.67	418	0.78	102
19.	2.65	1060	......	70	1.76	462	1.00	156	0.54	58	0.22	20	0.25	22	0.00	6	e—0.20	2	0.30	26	1.47	327	0.66	79
20, ...	1.99	586	......	70	1.62	394	0.95	143	0.49	51	0.27	24	0.10	10	e—0.20	2	e—0.20	2	0.45	45	1.44	314	0.61	70
21, ...	2.32	795	......	70	1.88	524	0.88	125	0.44	44	0.68	82	0.13	12	e—0.20	2	0.00	6	2.59	1010	1.36	280	0.78	102
22, ...	1.92	546	......	70	2.10	652	0.80	106	0.40	38	0.52	55	0.08	9	e—0.20	2	2.28	767	1.44	314	1.24	134	0.65	77
23, ...	1.71	437	......	70	1.62	394	0.77	100	0.69	84	0.40	38	0.11	11	e—0.20	2	0.83	113	1.09	183	1.17	210	0.69	84
24, ...	2.08	640	......	70	2.32	795	0.80	106	1.99	586	0.32	28	0.11	11	0.00	6	0.56	62	0.90	130	1.10	186	1.69	427
25, ...	1.84	503	......	70	2.13	671	0.78	102	1.24	234	0.31	27	0.30	26	0.06	8	0.48	49	0.87	123	1.08	180	1.30	256
26, ...	1.67	418	......	70	4.24	2560	0.70	86	1.00	156	1.11	189	0.36	33	0.03	7	0.32	28	1.05	171	0.99	153	1.21	224
27, ...	1.68	422	......	70	c7.16	5910	0.65	77	0.89	128	0.62	72	0.32	28	—0.02	6	0.33	30	1.07	177	0.96	146	1.10	186
28, ...	1.59	380	b3.30	1640	5.83	4200	d4.93	2350	1.37	284	0.79	101	0.18	16	0.01	6	0.23	20	0.94	140	0.86	120	1.58	375
29, ...	1.22	227	......	....	2.95	1320	2.83	1210	2.24	740	0.58	65	0.18	16	0.06	8	0.22	20	0.86	120	0.86	120	*	150
30, ...	1.32	264	......	....	2.29	773	2.00	592	1.52	349	0.63	73	0.21	19	0.67	9	0.22	20	0.81	108	0.94	140	......	150
31, ...	1.36	280	......	....	1.97	575	......	....	1.23	231	......	......	0.10	10	0.16	15	......	....	0.75	96	......	....	......	150

*Creek frozen Feb. 13-27, inclusive, and Dec. 29-31, inclusive, and discharge estimated from climatological records. a Max. 5.39 at 5 p. m., 3760 sec ft. b Max. 3.81 at 7 a. m., 2130 sec. ft. c Max. 8.46 at 5 p. m., 7840 sec. ft. d Max. 4.46 at 7 a. m., 2780 sec. ft. e Estimated.

ESTIMATED MONTHLY DISCHARGE OF WYALUSING CREEK, AT WYALUSING, BRADFORD COUNTY, PA.

(Drainage area 214 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	3760	227	821	3.836	4.423
February,	2130	....	181	0.846	0.881
March,	7840	111	952	4.449	5.129
April,	2780	77	363	1.696	1.893
May,	740	38	168	0.785	0.905
June,	189	20	63	0.294	0.328
July,	33	9	20	0.093	0.107
August,	16	e2	7	0.033	0.038
September,	767	e2	41	0.192	0.214
October,	1010	16	98	0.458	0.528
November,	2330	42	292	1.364	1,522
December,	....	70	147	0.687	0.792
The year,	3760	e2	263	1.228	16.760

e Estimated.

Creek frozen Feb. 13-27, inclusive and Dec. 20-31, inclusive and discharge estimated from climatological records.

LACKAWANNA RIVER.

DESCRIPTION OF BASIN.

Lackawanna river, one of the major tributaries of the North Branch of the Susquehanna river in northeastern Pennsylvania, drains an area of approximately 345 square miles in Susquehanna, Wayne, Lackawanna and Luzerne counties, on the west slope of the Delaware—Susquehanna Divide. Rising in numerous lakes in two branches, one on either side of the central part of the Wayne-Susquehanna county line, which join a short distance below Union Dale, Susquehanna county, it follows a southerly course through Susquehanna and Wayne counties and thence flows southwest through Lackawanna county to its mouth above Pittston, Luzerne county, a distance of approximately 50 miles. The upper section of this stream, to Forest City, Susquehanna county, flows through a rolling, farming country, sparsely populated and largely deforested. From this point the valley widens to approximately six miles in width, bounded on one side by Bald Mountain, and on the other by Moosic Mountain, partly covered with second growth timber, the stream flowing through a thickly populated coal mining territory.

The stream is exceedingly rapid, falling from the junction of the two branches (elevation 1,590 feet) at Stillwater to Olyphant, a distance of 23 miles, at the rate of 36 feet per mile; from Olyphant, through Scranton to Moosic, a distance of 12 miles, at the rate of 10 feet per mile; and from Moosic to its mouth (elevation 526 feet) a distance of four miles, at the rate of 27 feet per mile. It lies entirely within the glacial area. There are many tributaries, the largest of which are Spring and Roaring Brooks. The city of Scranton and many boroughs are located in this basin. On account of the presence of mine washings, the main stream is not used for water supply purposes, although some of its tributaries are extensively employed for this purpose. The dry weather flow is maintained above the natural flow of other streams in this section by the drainage of mine water into the stream.

The mean annual precipitation over this watershed is from 35 to 40 inches.

The discharge of this stream has been measured since August 8, 1913, at Moosic, a short distance above the mouth, and from July 1, 1908, to July 30, 1913, at Scranton, about eight miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 5.

LACKAWANNA RIVER AT SCRANTON, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through truss highway bridge, at Carbon Street, Scranton, Lackawanna county.

RECORDS AVAILABLE—Discharge complete July 1, 1908, to September 16, 1911, and February 2, 1912, to July 30, 1913.

DRAINAGE AREA—175 square miles.

GAGE—A standard chain gage was attached to the downstream handrail. The elevation of zero is 676.577 feet above sea level. The length of chain from the bottom of the weight to the marker was 20.83 feet. Bench Mark No. 1 is on spout of fire plug south corner of Carbon Street and Love Road, elevation 691.987 feet above sea level. Bench Mark No. 2 is on stone projection on top of eight course from top under left hand downstream corner of Carbon Street bridge, stone projects about six inches, elevation 682.801 feet above sea level. The gage was read twice daily by an employee of the City Engineer's Office.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the Carbon Street bridge from the downstream girder of water pipe bridge just below, or by wading several hundred feet upstream at lowest stages. The initial point for soundings is the right end of the downstream handrail on the Carbon Street bridge, and right end of downstream girder of water pipe bridge.

CHANNEL—The channel above the station makes a sharp curve to the right. Below the station it is fairly straight for 1,000 feet. Both banks are high and not subject to overflow. The bed is composed of mud and loose stones, covered with a heavy coating of culm. The thread of the stream under the bridge is at an angle of about 25 degrees, but is practically normal under the water pipe bridge, except at high stages.

REMARKS—This station discontinued July 30, 1913. Re-established August 8, 1913, at Moosic, Lackawanna county.

DISCHARGE TABLE FOR LACKAWANNA RIVER AT SCRANTON, LACKAWANNA COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.00	60	.50	380	4.00	1120	.50	2040	7.00	3145
.10	66	.60	422	.10	1175	.60	2110	.10	3225
.20	73	.70	466	.20	1230	.70	2180	.20	3305
.30	81	.80	510	.30	1290	.80	2250	.30	3385
.40	91	.90	556	.40	1350	.90	2320	.40	3470
.50	105	3.00	604	.50	1410	6.00	2390	.50	3555
.60	120	.10	652	.60	1470	.10	2460	.60	3640
.70	137	.20	700	.70	1530	.20	2535	.70	3725
.80	155	.30	750	.80	1590	.30	2610	.80	3810
.90	178	.40	800	.90	1650	.40	2685	.90	3895
2.00	205	.50	850	5.00	1715	.50	2760	8.00	3980
.10	235	.60	900	.10	1780	.60	2835		
.20	267	.70	955	.20	1845	.70	2910		
.30	302	.80	1010	.30	1910	.80	2985		
.40	340	.90	1065	.40	1975	.90	3065		

Note.—This rating table is only applicable subsequent to Jan. 1st, 1912, and is based on two discharge measurements made during 1912 and 1913, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF LACKAWANNA RIVER AT SCRANTON, LACKAWANNA CO., PA.

1913.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.		JUNE.		JULY.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	2.89	552	2.96	585	2.10	235	3.54	870	2.83	524	*2.48	372	1.45	98
2,	2.79	506	*2.90	556	*2.24	281	3.12	662	2.73	479	2.36	325	1.47	101
3,	3.70	955	2.83	524	2.38	332	3.06	633	2.67	453	2.15	251	1.45	98
4,	4.03	1140	3.26	730	2.42	348	2.96	585	*2.54	397	2.11	238	1.44	97
5,	*3.88	1050	2.83	524	2.30	302	3.01	609	2.40	340	2.02	211	1.46	99
6,	3.74	977	3.01	609	2.25	285	*3.12	662	2.33	313	1.93	186	*1.45	98
7,	3.91	1070	2.68	457	2.00	205	3.22	710	2.29	298	2.03	214	1.44	97
8,	6.44	2720	2.33	312	1.94	189	2.90	556	2.27	292	*2.00	205	1.40	91
9,	5.13	1800	*2.23	278	*2.07	226	2.74	484	2.06	223	1.96	194	1.40	91
10,	4.13	1190	2.13	245	2.20	267	2.35	321	2.02	211	1.90	178	1.59	118
11,	3.95	1090	1.98	200	2.74	484	2.96	585	*2.06	223	1.83	162	1.56	114
12,	*3.89	1060	1.90	178	2.62	431	3.26	730	1.98	200	1.81	157	†2.00	205
13,	3.83	1030	1.88	173	2.40	340	*3.34	770	1.89	176	1.76	148	*1.72	141
14,	3.56	880	1.88	173	5.27	1890	3.42	810	1.84	164	1.71	139	1.43	95
15,	3.43	815	1.86	169	5.03	1740	3.28	740	1.64	127	*1.70	137	1.36	87
16,	3.23	715	*1.87	171	*4.36	1330	3.23	715	1.80	155	1.68	134	1.31	82
17,	3.31	755	1.88	173	3.70	955	2.88	547	1.81	157	1.68	134	1.32	83
18,	3.57	885	1.86	169	3.14	671	2.63	435	*1.72	141	1.59	118	1.36	87
19,	*3.29	745	1.84	164	2.90	556	2.47	368	1.64	127	1.56	114	1.36	87
20,	3.01	609	1.86	169	3.42	810	....	....	1.62	123	1.62	123	†1.96	194
21,	2.88	547	1.88	173	3.42	810	....	....	1.50	105	1.96	194	1.46	99
22,	2.81	515	2.18	261	3.18	690	....	....	1.86	169	*1.88	173	1.30	81
23,	2.75	488	*2.19	264	*3.25	725	....	....	1.90	178	1.81	157	1.36	87
24,	4.17	1210	2.20	267	3.32	760	....	....	1.83	162	1.58	117	1.92	183
25,	3.34	770	2.14	248	3.30	750	....	....	*1.92	183	1.50	105	1.76	148
26,	*3.26	730	2.08	229	5.46	2010	....	....	2.02	211	1.49	104	1.46	99
27,	3.18	690	1.97	197	a9.40	5140	....	....	2.08	229	1.49	104	*1.50	105
28,	3.15	676	2.02	211	7.25	3350	2.94	575	2.66	448	1.48	102	1.54	111
29,	3.01	609	....	....	4.72	1540	3.01	609	2.67	453	*1.47	101	1.52	108
30,	2.95	580	....	....	*4.31	1300	2.97	590	2.60	422	1.46	99	1.36	87
31,	2.91	561	....	....	*3.92	1080	....	....	2.59	418	....	....	....	....

*Interpolated. †Estimated. a=Max. 10.80 at 4.00 P. M.=6560 sec. ft. Note.—Station discontinued July 30, 1913. Re-established Aug. 8, 1913, at Moosic.

ESTIMATED MONTHLY DISCHARGE OF LACKAWANNA RIVER, AT SCRANTON, LACKAWANNA COUNTY, PA.

(Drainage area 175 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	2720	488	901	5.149	5.936
February,	730	164	300	1.714	1.785
March,	6560	189	969	5.537	6.383
April,	b870	b321	b617	b3.526	b2.879
May,	524	105	261	1.491	1.719
June,	372	99	167	0.954	1.064
July,	205	81	109	0.623	0.695

b=for 22 days. Note.—Station discontinued July 30, 1913. Re-established Aug. 8, 1913, at Moosic.

SUSQUEHANNA BASIN—STATION NO. 6.

LACKAWANNA RIVER AT MOOSIC.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge at Main Street, near D. & H. Railroad Station, Moosic, Lackawanna county.

RECORDS AVAILABLE—Discharge measurements and daily gage heights from August 8 to December 31, 1913.

DRAINAGE AREA—265 square miles.

GAGE—A standard chain gage is attached to the wooden hand-rail on the downstream side of the bridge near the right end. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 17.84 feet. Bench Mark No. 1 is a cross cut on shelf in second stone from end on downstream wingwall of right abutment, 12th course from top, elevation 6.03 feet above gage datum. The gage is read twice daily by Nelson Ross.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, the initial point for soundings being the extreme end of the wooden handrail, left downstream side.

CHANNEL—The channel is straight for 200 feet above and below the bridge, the thread of the stream passing under the bridge at a slight angle. Both banks are high, but the right bank may over-flow during extreme high stages. The bed is composed of rocks and culm, and is somewhat shifting. There is a good measurable velocity under the bridge at all stages.

DISCHARGE MEASUREMENTS OF LACKAWANNA RIVER, AT MOOSIC, LACKAWANNA COUNTY, PA.

(Drainage area 265 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
1	Aug. 8	Reckord, ...	109	113	1.16	1.98	131	Surface msmt.
2	Sept. 25	Boehringer, ...	110	83	1.16	1.98	96	Surface msmt.
3	Dec. 9	Boehringer, ...	112	186	1.81	2.54	336	0.6 msmt.

DAILY MEAN GAGE HEIGHTS OF LACKAWANNA RIVER AT MOOSIC, LACKAWANNA COUNTY, PA.

1913.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	....	....	2.02	2.17	2.32
2,	....	....	2.17	2.14	2.28
3,	....	....	2.22	2.10	2.28
4,	....	....	2.09	2.12	2.26
5,	....	....	2.04	2.12	2.19
6,	....	....	2.03	2.08	2.23
7,	....	....	1.99	2.08	2.43
8,	1.98	....	1.98	2.08	2.68
9,	1.98	....	1.98	2.68	2.58
10,	1.99	1.98	1.97	3.32	2.45
11	2.00	1.95	2.00	2.83	2.44
12,	1.99	1.95	2.08	2.63	2.36
13,	1.98	2.00	2.04	2.56	2.40
14,	2.00	1.95	2.02	2.60	2.36
15,	1.99	1.90	1.92	2.60	2.37
16,	1.99	1.90	1.93	2.67	2.33
17,	2.04	1.90	1.91	2.66	2.37
18,	2.00	2.00	1.97	2.60	2.33
19,	1.98	1.99	1.94	2.60	2.30
20,	1.98	1.99	2.78	2.62	2.27
21,	1.98	2.14	2.77	2.56	2.29
22,	1.99	2.50	2.54	2.56	2.23
23,	2.05	2.24	2.37	2.52	2.24
24,	2.00	2.12	2.26	2.48	2.42
25,	1.98	2.04	2.34	2.38	2.44
26,	2.10	1.98	2.43	2.37	2.68
27,	2.00	1.98	2.38	2.32	2.44
28,	1.99	1.95	2.28	2.27	2.38
29,	1.98	1.95	2.23	2.34	2.33
30,	2.00	1.97	2.18	2.43	2.37
31,	....	....	2.16	....	2.37

Note.—Aug. 30 observer resigned. New observer employed Sept. 10.

SUSQUEHANNA BASIN—STATION NO. 7.

NORTH BRANCH SUSQUEHANNA RIVER AT WILKES-BARRE.

DESCRIPTION OF STATION.

LOCATION—On four span, steel, through-truss, highway bridge, at Market Street, Wilkes-Barre, Luzerne county.

RECORDS AVAILABLE—Discharge complete from March 30, 1899, to December 31, 1913.

DRAINAGE AREA—9,960 square miles.

GAGE—A Mott gage is fastened to the upstream handrail of the bridge. The elevation of zero is 505.3 feet above mean sea level. Bench Mark No. 1 is extreme west end of stone door-sill of North entrance to Coal Exchange Building, elevation 32.99 feet above gage datum. Bench Mark No. 2 is top of rail in front of Lehigh Valley Depot, elevation 39.7 feet above gage datum. Bench Mark No. 3 is top of stone monument at Northampton and River streets, elevation 30.70 feet above gage datum. The gage is read once daily by Obadiah Hemstreet.

DISCHARGE MEASUREMENTS—Taken from the upstream side of the bridge. The initial point for soundings is end of iron handrail on upstream side of bridge at left bank.

CHANNEL—The channel above and below the bridge is straight for ¼ mile. The right bank is low and overflows at gage height 18 feet. The left bank is high. The bed is composed of sand and gravel.

DISCHARGE MEASUREMENTS OF NORTH BRANCH SUSQUEHANNA RIVER, AT WILKES-BARRE, LUZERNE COUNTY, PA.

(Drainage area 9960 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
36	Aug. 5	Reckord, ...	364	2801	0.36	2.13	1017	0.6 method.
37	Dec. 9	Boehringer, ...	574	4172	1.61	4.58	6710	Surf. msmt.

DISCHARGE TABLE FOR NORTH BRANCH SUSQUEHANNA RIVER, AT WILKES-BARRE, LUZERNE COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.90	820	.30	12560	.70	33020	.10	56340	.50	91070
2.00	845	.40	13000	.80	33520	.20	56980	.60	91990
.10	895	.50	13440	.90	34020	.30	57620	.70	92910
.20	970	.60	13880	11.00	34520	.40	58260	.80	93830
.30	1055	.70	14320	.10	35020	.50	58920	.90	94760
.40	1155	.80	14760	.20	35520	.60	59600	20.00	95700
.50	1270	.90	15200	.30	36020	.70	60280	.10	96660
.60	1395	7.00	15640	.40	36520	.80	60980	.20	97690
.70	1530	.10	16080	.50	37020	.90	61680	.30	98780
.80	1680	.20	16520	.60	37520	16.00	62400	.40	99920
.90	1840	.30	16970	.70	38020	.10	63120	.50	101110
3.00	2005	.40	17420	.80	38520	.20	63850	.60	102300
.10	2185	.50	17870	.90	39020	.30	64590	.70	103540
.20	2380	.60	18320	12.00	39520	.40	65340	.80	104830
.30	2590	.70	18770	.10	40020	.50	66100	.90	106180
.40	2810	.80	19220	.20	40520	.60	66860	21.00	107600
.50	3035	.90	19670	.30	41020	.70	67630	.10	109030
.60	3265	8.00	20120	.40	41520	.80	68410	.20	110480
.70	3500	.10	20590	.50	42020	.90	69200	.30	111950
.80	3750	.20	21060	.60	42520	17.00	70000	.40	113440
.90	4000	.30	21530	.70	43040	.10	70800	.50	114950
4.00	4250	.40	22000	.80	43560	.20	71600	.60	116460
.10	4510	.50	22470	.90	44080	.30	72400	.70	117990
.20	4780	.60	22940	13.00	44600	.40	73200	.80	119540
.30	5070	.70	23410	.10	45120	.50	74000	.90	121110
.40	5380	.80	23880	.20	45640	.60	74800	22.00	122700
.50	5710	.90	24350	.30	46160	.70	75600	.10	124280
.60	6050	9.00	24820	.40	46680	.80	76400	.20	125860
.70	6400	.10	25290	.50	47200	.90	77200	.30	127440
.80	6750	.20	25760	.60	47720	18.00	78000	.40	129020
.90	7100	.30	26230	.70	48240	.10	78810	.50	130600
5.00	7450	.40	26700	.80	48760	.20	79630	.60	132180
.10	7800	.50	27170	.90	49280	.30	80460	.70	133760
.20	8160	.60	27640	14.00	49820	.40	81300	.80	135340
.30	8540	.70	28110	.10	50380	.50	82150	.90	136920
.40	8930	.80	28580	.20	50940	.60	83000	23.00	138500
.50	9320	.90	29050	.30	51500	.70	83860	24.00	154250
.60	9710	10.00	29520	.40	52080	.80	84730	25.00	170000
.70	10100	.10	30020	.50	52660	.90	85610	26.00	186000
.80	10500	.20	30520	.60	53240	19.00	86500	27.00	201500
.90	10900	.30	31020	.70	53840	.10	87400	28.00	217300
6.00	11300	.40	31520	.80	54440	.20	88310	29.00	233000
.10	11710	.50	32020	.90	55060	.30	89230	.50	240850
.20	12120	.60	32520	15.00	55700	.40	90150	30.00	248700

Note.—This table is only applicable subsequent to January 1, 1912, and is based on 2 discharge measurements made during 1912-1913, together with former curve,

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF NORTH BRANCH SUSQUEHANNA RIVER AT WILKES-BARRE, LUZERNE COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G.H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ..	6.13	11800	6.53	13600	7.83	19400	13.33	46300	10.13	30200	7.64	18500	3.04	2080	2.24	1000	2.01	850	2.33	1080	4.01	4280	4.68	6330
2, ..	7.13	16200	6.63	14000	8.63	23100	11.73	38200	8.13	20700	6.54	13600	2.94	1910	2.54	1320	1.99	842	2.42	1180	3.85	3880	4.70	6400
3, ..	7.23	16700	6.13	11800	8.33	21700	10.53	32200	7.03	15800	5.74	10300	2.74	1590	2.24	1000	2.00	845	2.39	1140	3.69	3480	4.76	6610
4, ..	12.73	43200	6.13	11800	7.13	16200	9.63	27800	6.23	12300	5.24	8310	2.84	1740	2.24	1000	1.99	842	2.39	1140	3.49	3010	4.66	6260
5, ..	15.93	61900	5.53	9440	6.43	13100	9.33	26400	5.63	9830	5.04	7590	2.74	1590	2.16	940	2.03	860	2.31	1060	3.36	2720	4.50	5710
6, ..	12.53	42200	*6.03	11400	5.93	11000	8.63	23100	5.23	8270	4.74	6540	2.64	1450	2.16	940	1.97	838	2.33	1080	3.30	2590	4.36	5260
7, ..	11.03	34700	8.43	22100	5.43	9050	8.43	22100	5.03	7560	4.44	5510	2.64	1450	2.14	925	1.99	842	2.33	1080	3.17	2320	4.38	5320
8, ..	12.93	44200	7.83	19400	5.03	7560	8.03	20300	4.73	6500	4.24	4900	2.54	1320	2.19	962	2.02	855	2.29	1050	3.10	2180	4.31	5100
9, ..	17.93	77400	7.33	17100	4.53	5810	7.53	18000	4.53	5810	4.14	4620	2.54	1320	2.24	1000	1.99	842	2.27	1030	3.22	2420	4.60	6050
10, ..	18.43	81600	7.23	16700	4.63	6160	7.13	16200	4.33	5160	3.94	4100	2.64	1450	2.22	987	1.93	828	2.24	1000	6.95	15400	4.96	7310
11, ..	14.03	50000	6.43	13100	5.03	7560	6.73	14500	4.13	4590	3.84	3850	2.74	1590	2.16	940	1.93	828	2.22	987	10.89	34000	5.23	8270
12, ..	12.03	39700	5.93	11000	7.53	18000	7.23	16700	4.03	4330	3.74	3600	2.64	1450	2.18	955	1.90	820	2.33	1080	9.90	29000	4.81	6780
13, ..	13.63	47900	5.43	9050	8.43	22100	7.93	19800	3.93	4080	3.64	3360	2.64	1450	2.14	925	1.93	828	2.22	987	8.37	21900	4.66	6260
14, ..	13.43	46800	†5.13	7910	8.53	22600	8.33	21700	3.73	3580	3.54	3130	2.54	1320	2.12	910	1.93	828	2.29	1050	7.07	15900	4.36	5260
15, ..	10.93	34200	†4.93	7200	11.03	34700	7.93	19800	3.63	3340	3.44	2900	2.54	1320	2.11	902	1.81	822	2.25	1010	6.69	14300	4.46	5580
16, ..	9.43	26800	5.23	8270	14.03	50000	7.33	17100	3.53	3100	3.34	2680	2.54	1320	2.12	910	1.90	820	2.21	978	6.95	15400	4.56	5910
17, ..	8.93	24500	5.23	8270	13.73	48400	6.93	15300	3.53	3100	3.24	2460	2.44	1200	2.11	902	1.90	820	2.23	996	7.10	16100	4.66	6260
18, ..	9.53	27300	4.53	5810	11.33	36200	6.43	13100	3.53	3100	3.14	2260	2.44	1200	2.07	880	1.93	828	2.31	1060	6.87	15100	4.53	5810
19, ..	12.93	44200	‡4.33	5160	9.23	25900	6.13	11800	3.33	2660	3.04	2080	2.44	1200	2.05	870	1.93	828	2.29	1050	6.55	13700	4.46	5580
20, ..	13.63	47900	3.83	3820	8.03	20300	5.73	10200	3.43	2880	2.94	1910	2.44	1200	2.03	860	1.90	820	2.47	1240	6.18	12000	4.26	4950
21, ..	12.23	40700	3.93	4080	8.13	20700	5.43	9050	3.33	2660	3.14	2260	2.44	1200	2.02	855	1.91	822	3.80	3750	5.95	11100	4.20	4780
22, ..	11.83	38700	4.13	4590	9.23	25900	5.23	8270	3.33	2660	3.24	2460	2.34	1100	2.04	865	2.71	1540	4.25	4920	5.85	10700	4.06	4410
23, ..	11.03	34700	4.53	5810	9.63	27800	5.13	7910	3.43	2880	3.04	2080	2.40	1160	2.06	875	2.93	1890	4.60	6050	6.19	12100	3.98	4200
24, ..	10.23	30700	4.83	6860	9.03	25000	4.93	7200	4.03	4330	2.94	1910	2.54	1320	2.02	855	2.63	1430	4.71	6440	5.85	10700	4.16	4670
25, ..	9.73	28300	4.93	7200	8.73	23600	4.83	6860	4.93	7200	2.84	1740	2.44	1200	2.01	850	2.52	1300	4.37	5290	5.45	9120	4.86	6960
26, ..	9.73	28300	5.83	10600	11.13	35200	4.83	6860	5.73	10200	2.74	1590	2.44	1200	2.01	850	2.71	1540	4.23	4870	5.25	8350	5.51	9360
27, ..	9.03	25000	4.83	6860	26.02	186000	4.73	6500	5.53	9440	3.04	2080	2.44	1200	2.02	855	2.62	1420	4.15	4640	5.10	7800	5.50	9320
28, ..	8.43	22100	4.93	7200	a28.00	217000	7.23	16700	5.63	9830	3.04	2080	2.44	1200	2.00	845	2.51	1280	6.87	15100	4.95	7280	5.06	7660
29, ..	7.93	19800	......	......	26.49	194000	13.93	49400	8.33	21700	3.04	2080	2.44	1200	2.02	855	2.45	1210	5.33	8660	4.85	6920	4.36	5260
30, ..	7.23	16700	......	......	21.23	111000	13.93	49400	10.93	34200	3.14	2260	2.34	1100	2.02	855	2.36	1120	4.69	6360	4.71	6440	3.96	4150
31, ..	6.63	14000	......	......	16.63	67100	......	......	9.13	25400	......	....	2.34	1100	2.01	850	....	......	4.40	5380	......	......	3.84	3850

Note.—*Frozen. †Frozen under gage. ‡River nearly clear of ice. a=Max. 28.46′ at 5 A. M. 225000 sec ft.

ESTIMATED MONTHLY DISCHARGE OF NORTH BRANCH SUSQUEHANNA RIVER, AT WILKES-BARRE, LUZERNE COUNTY, PA.

(Drainage area 9960 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	81600	11800	36100	3.625	4.179
February,	22100	3820	10000	1.004	1.045
March,	225000	5810	43600	4.378	5.048
April,	49400	6500	20000	2.009	2.242
May,	34200	2660	9270	0.931	1.073
June,	18500	1590	4420	0.444	0.495
July,	2080	1100	1360	0.137	0.158
August,	1320	845	921	0.092	0.106
September,	1890	820	1010	0.101	0.113
October,	15100	978	2990	0.300	0.346
November,	34000	2180	10700	1.074	1.198
December,	9360	3850	5990	0.601	0.693
The year,	225000	820	12200	1.225	16.696

SUSQUEHANNA BASIN—STATION NO. 8.

NORTH BRANCH SUSQUEHANNA RIVER AT DANVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On seven span, steel, through truss highway bridge, between Danville and South Danville, Montour county, 11 miles above the mouth.

RECORDS AVAILABLE—Discharge complete from March 25, 1899, to March 9, 1904, and from March 24, 1905, to December 31, 1913.

DRAINAGE AREA—11,300 square miles.

GAGE—A standard chain gage is fastened to the downstream handrail, first span from Danville side. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 44.67 feet. Bench Mark No. 1 is extreme south end of stone doorsill at east entrance to City Filtration Plant, elevation 31.70 feet above gage datum. Bench Mark No. 2 is point on face of first course of right abutment, located 0.25 feet from the top of the course, and 2.65 feet from the downstream side of the course, elevation 14.05 feet above gage datum. The gage is read twice daily by E. F. Bell.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, the initial point for soundings being face of right abutment at downstream corner

CHANNEL—The channel above and below the station is straight for one-half mile. The right bank is liable to overflow during extreme high stages. The left bank is high and not subject to overflow. The bed is rocky with some gravel.

DISCHARGE MEASUREMENTS OF NORTH BRANCH SUSQUEHANNA RIVER, AT DANVILLE, MONTOUR COUNTY, PA.

(Drainage area 11300 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
32	1913. Aug. 4	Reckord, ...	663	1539	1.04	2.10	1593	0.6 method.

DISCHARGE TABLE FOR NORTH BRANCH SUSQUEHANNA RIVER, AT DANVILLE, MONTOUR COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet	Sec. ft.	Feet	Sec. ft.	Feet	Sec. ft.	Feet	Sec. ft.	Feet	Sec. ft.
.60	790	.60	15860	.60	42450	.60	80780	.40	127200
.70	920	.70	16390	.70	43300	.70	81860	.50	128620
.80	1070	.80	16920	.80	44160	.80	82940	.60	130060
.90	1240	.90	17460	.90	45030	.90	84020	.70	131500
2.00	1420	6.00	18000	10.00	45900	14.00	85120	.80	132960
.10	1620	.10	18540	.10	46770	.10	86220	.90	134420
.20	1830	.20	19090	.20	47650	.20	87320	18.00	135900
.30	2060	.30	19640	.30	48530	.30	88440	.10	137380
.40	2300	.40	20200	.40	49420	.40	89560	.20	138880
.50	2560	.50	20770	.50	50310	.50	90680	.30	140380
.60	2840	.60	21340	.60	51200	.60	91820	.40	141880
.70	3140	.70	21920	.70	52090	.70	92960	.50	143400
.80	3460	.80	22510	.80	52990	.80	94100	.60	144920
.90	3780	.90	23100	.90	53890	.90	95260	.70	146440
3.00	4120	7.00	23700	11.00	54800	15.00	96420	.80	147980
.10	4480	.10	24310	.10	55720	.10	97580	.90	149520
.20	4840	.20	24930	.20	56650	.20	98760	19.00	151060
.30	5220	.30	25550	.30	57590	.30	99940	.10	152620
.40	5600	.40	26180	.40	58530	.40	101140	.20	154180
.50	6000	.50	26820	.50	59480	.50	102340	.30	155740
.60	6400	.60	27460	.60	60430	.60	103560	.40	157320
.70	6800	.70	28110	.70	61390	.70	104780	.50	158900
.80	7220	.80	28770	.80	62360	.80	106020	.60	160480
.90	7660	.90	29430	.90	63340	.90	107260	.70	162080
4.00	8100	8.00	30100	12.00	64320	16.00	108520	.80	163680
.10	8550	.10	30780	.10	65300	.10	109780	.90	165280
.20	9000	.20	31470	.20	66280	.20	111060	20.00	166880
.30	9460	.30	32180	.30	67280	.30	112340	.10	168500
.40	9920	.40	32900	.40	68280	.40	113640	.20	170120
.50	10390	.50	33630	.50	69280	.50	114940	.30	171740
.60	10860	.60	34380	.60	70300	.60	116260	.40	173360
.70	11340	.70	35140	.70	71320	.70	117580	.50	175000
.80	11820	.80	35910	.80	72340	.80	118920	.60	176640
.90	12310	.90	36700	.90	73380	.90	120260	.70	178280
5.00	12800	9.00	37500	13.00	74420	17.00	121620	.80	179920
.10	13300	.10	38310	.10	75460	.10	123000	.90	181580
.20	13800	.20	39120	.20	76520	.20	124380	21.00	183240
.30	14310	.30	39940	.30	77580	.30	125780		
.40	14820	.40	40770	.40	78640				
.50	15340	.50	41610	.50	79700				

Note.—The above table is that of the U. S. G. S, and has been adopted by the Water Supply Commission for 1912 and 1913.

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DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF NORTH BRANCH SUSQUEHANNA RIVER AT DANVILLE, MONTOUR COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	5.36	14600	5.86	17200	6.26	19400	12.16	65900	c10.06	46400	7.02	23800	2.78	3400	2.22	1880	1.80	1070	2.27	1990	3.65	6600	4.00	8100
2,	5.88	17400	5.81	17000	7.06	24100	9.91	45100	7.81	28800	5.92	17600	2.74	3270	2.16	1750	1.88	1210	2.25	1940	3.48	5920	3.90	7660
3,	7.31	25600	5.71	16400	7.61	27500	8.99	37400	6.69	21900	5.22	13900	2.64	2960	2.12	1660	1.82	1100	2.24	1920	3.35	5410	3.90	7660
4,	9.41	40900	5.61	15900	7.46	26600	8.15	31100	5.91	17500	4.72	11400	2.54	2670	2.12	1660	1.80	1070	2.22	1880	3.20	4840	3.92	7750
5,	12.96	74000	*5.34	14500	5.86	17200	7.81	28800	5.39	14800	4.39	9870	2.48	2510	2.09	1600	1.80	1070	2.23	1900	3.40	5600	3.82	7300
6,	11.26	57200	4.36	9740	5.51	15400	7.46	26600	4.95	12600	4.17	8860	2.52	2620	2.04	1500	1.80	1070	2.11	1640	3.00	4120	3.72	6880
7,	9.64	42800	4.26	9280	4.94	12500	7.11	24400	4.66	11100	3.97	7970	2.49	2530	2.03	1480	1.80	1070	2.11	1640	2.90	3780	3.75	7010
8,	10.68	51900	3.86	7480	4.58	10800	6.61	21400	4.33	9600	3.82	7300	2.43	2380	2.05	1520	1.76	1010	2.11	1640	2.84	3590	‡3.96	7920
9,	14.66	92500	3.76	7050	4.11	8600	6.39	20100	4.16	8820	3.72	6880	2.34	2160	1.99	1400	1.75	995	2.10	1620	2.80	3460	4.18	8910
10,	15.24	99200	3.81	7260	4.14	8730	6.04	18300	3.96	7920	3.52	6080	2.32	2110	1.95	1330	1.74	980	2.10	1620	3.70	6800	4.02	8190
11,	12.16	65900	3.74	6970	4.46	10200	5.86	17200	3.86	7480	3.47	5880	2.56	2730	2.00	1420	1.73	965	2.08	1580	7.00	23700	4.38	9830
12,	10.56	50800	3.66	6640	5.81	17000	6.16	18900	3.73	6930	3.38	5520	2.52	2620	2.01	1440	1.72	950	2.09	1600	8.35	32500	4.32	9550
13,	10.66	51700	3.66	6640	6.68	21800	6.81	22600	3.59	6360	3.30	5220	2.56	2730	1.95	1330	1.72	950	2.10	1620	7.18	24800	4.10	8550
14,	11.48	59300	3.56	6240	7.71	28200	7.09	24200	3.51	6040	3.22	4920	2.57	2760	2.00	1420	1.73	965	2.12	1660	6.18	19000	3.95	7880
15,	9.71	43400	3.56	6240	9.41	40900	7.01	23800	3.45	5800	3.12	4550	2.41	2400	1.95	1330	1.72	950	2.05	1520	5.65	16100	3.80	7220
16,	8.36	32600	3.56	6240	10.86	53500	6.61	21400	3.41	5640	3.03	4230	2.40	2300	1.92	1280	1.72	950	2.06	1540	5.62	16000	3.78	7140
17,	7.84	29000	3.66	6640	11.76	62000	6.21	19100	3.29	5180	3.02	4190	2.32	2110	1.87	1190	1.70	920	2.06	1540	5.92	17600	3.92	7750
18,	8.11	30800	3.74	6970	10.14	47100	5.86	17200	3.26	5070	2.92	3850	2.30	2060	1.92	1280	1.75	995	2.06	1540	5.85	17200	3.88	7570
19,	10.06	46400	3.61	6440	8.46	33300	5.51	15400	3.21	4880	2.82	3520	2.26	1970	1.90	1240	1.73	965	2.06	1540	5.62	16000	3.80	7220
20,	11.06	55400	3.68	6720	7.31	25600	5.26	14100	3.22	4920	2.80	3460	2.26	1970	1.88	1210	1.73	965	2.30	2060	5.28	14200	3.72	6880
21,	10.41	49500	3.65	6600	6.99	23600	4.83	12000	3.11	4520	3.04	4260	2.30	2060	1.82	1100	1.73	965	2.95	3950	5.05	13000	3.50	6000
22,	9.84	44500	3.68	6720	7.79	28700	4.63	11000	3.06	4340	3.02	4190	2.28	2010	1.80	1070	3.20	4840	3.75	7010	4.90	12300	3.58	6320
23,	9.58	42300	3.76	7050	8.11	30800	4.52	10500	3.26	5070	2.97	4020	2.42	2350	1.82	1100	2.90	3780	3.78	7140	4.95	12600	3.52	6080
24,	8.94	37000	4.46	10200	7.99	30000	4.39	9870	3.76	7050	2.79	3430	2.62	2900	1.82	1100	2.68	3080	4.04	8280	5.05	13000	3.62	6480
25,	8.51	33700	4.31	9510	7.59	27400	4.27	9320	3.96	7920	2.72	3200	2.77	3360	1.84	1140	2.51	2590	4.08	8460	4.85	12100	3.82	7300
26,	8.44	33200	4.61	10900	8.46	33300	4.19	8960	4.46	10200	2.72	3200	2.44	2400	1.80	1070	2.38	2250	3.95	7880	4.49	10300	4.70	11300
27,	7.96	29800	4.44	10100	16.21	111000	4.11	8600	4.96	12600	2.77	3360	2.32	2110	1.80	1070	2.35	2180	3.85	7440	4.32	9550	5.08	13200
28,	7.44	26400	5.11	13400	a22.73	†226000	7.66	27900	5.16	13600	2.87	3680	2.32	2110	1.80	1070	2.36	2200	4.50	10400	4.22	9090	4.68	11200
29,	6.91	23200	......	......	21.91	†208000	11.81	62500	6.19	19000	2.72	3200	2.32	2110	1.80	1070	2.32	2110	5.25	14100	4.12	8640	4.35	9690
30,	6.46	20500	......	......	19.21	154000	b13.11	75600	9.13	38600	2.78	3400	2.30	2060	1.80	1070	2.26	1970	4.38	9830	4.05	8320	3.90	7660
31,	6.11	18600	......	......	15.01	96500	......	......	7.99	30000	....	......	2.24	1920	1.80	1070	....	......	3.90	7660	....	......	3.68	6720

†Estimated. ‡Interpolated. *River frozen under gage Feb. 5 to 13 inclusive. a=Max. 23.11 at 4:45 P. M.=† 235000 sec ft. b=Max. 13.61 at 6:30 A. M.=80900 sec. ft. c=Max. 10.81 at 6:30 A. M.=53100 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF NORTH BRANCH SUSQUEHANNA RIVER, AT DANVILLE, MONTOUR COUNTY, PA.

(Drainage area 11300 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	99200	14600	43200	3.823	4.400
February,	17200	6240	9360	0.828	0.862
March,	†235000	8600	47700	4.221	4.866
April,	80900	8600	25000	2.212	2.468
May,	53100	4340	12600	1.115	1.268
June,	23800	3200	6500	0.575	0.642
July,	3400	1920	2440	0.216	0.249
August,	1880	1070	1320	0.117	0.135
September,	4840	920	1540	0.136	0.152
October,	14100	1520	4070	0.360	0.415
November,	32500	3460	11900	1.053	1.175
December,	13200	6000	8030	0.711	0.820
The year,	†235000	920	14500	1.281	17.452

†Estimated.

CHEST CREEK.

DESCRIPTION OF BASIN.

Chest creek, an important tributary of the West Branch of the Susquehanna river, rises in the central part of Cambria county, flows 19 miles in a northerly direction to the Cambria-Clearfield county line and passes into and through the latter county in a north-northwesterly direction for 16 miles to its mouth at Mahaffey, Clearfield county. The total length of the stream is 35 miles, and its drainage area comprises 132 square miles.

Rising on the north slope of the Allegheny mountains, at an elevation of over 2,000 feet, it flows 14 miles through a sparsely inhabited section to a short distance below Patton, Cambria county, where it enters and flows through a narrow valley for four miles to Aldburn, Cambria county. Below Aldburn, it flows 17 miles, through a valley more densely populated, to its mouth at Mahaffey, Clearfield county. The total fall of the creek from its source to its mouth is 792 feet, at the rate of 23 feet per mile. There are numerous small tributaries, none of which attain any considerable size.

The creek is bordered on both sides throughout its course by high hills partly timbered, while the most important industries in this valley are the mining of coal, farming and lumbering.

The principal towns in this watershed are Mahaffey, Westover, Hastings and Patton.

Gaging Station on Chest Creek, at St. Lu.

The mean annual precipitation over this watershed is from 45 to 50 inches. The discharge of Chest Creek has been measured since October 2, 1913, at St. Lu, 5 miles above the mouth.

SUSUQEHANNA BASIN—STATION NO. 9.

CHEST CREEK AT ST. LU, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss highway bridge at St. Lu, Clearfield county, Pa.

RECORDS AVAILABLE—Discharge measurements and gage heights October 2 to December 31, 1913.

DRAINAGE AREA—110 square miles.

GAGE—A standard chain gage attached to the latticed handrail, downstream side of bridge. The elevation of zero is arbitrary. The length of chain from bottom of weight to marker is 19.35 feet. Bench Mark No. 1 is berm on face of left downstream wingwall, 5th course below coping, 1.5 feet from end of wall, and 0.3 feet below top of course, elevation 9.66 feet above gage datum. The gage is read twice daily by J. F. Blankenbicker.

DISCHARGE MEASUREMENTS—Taken from the downstream side of bridge, and by wading at a section 50 feet below the bridge during low stages. The initial point for soundings is left end of handrail, downstream side.

CHANNEL—The channel above the station is straight for a short distance, and below the station it is straight for 500 feet. The right bank is low and subject to overflow at extreme high stages. The left bank is high and not subject to overflow. The bed is of gravel, with good velocity under the bridge.

REMARKS—There is a low abandoned timber crib dam about 200 feet above the bridge. A head race leads around the bridge on the left, and water may pass through during extreme high stages.

DISCHARGE MEASUREMENTS OF CHEST CREEK, AT ST. LU, CLEARFIELD COUNTY, PA.

(Drainage area 110 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913.		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
1	Oct. 2	Hosmer,	119	196	0.41	3.96	81	0.6 method.
2	Nov. 8	Boehringer,	120	206	0.42	3.93	86	Surface msmt.
3	Dec. 4	Hosmer,	118	200	0.45	4.06	91	0.6 method.

DAILY MEAN GAGE HEIGHTS OF CHEST CREEK AT ST. LU, CLEARFIELD COUNTY, PA.

1913.	OCTOBER.	NOVEMBER.	DECEMBER.
	G. H.	G. H.	G. H.
1,	....	4.19	4.18
2,	4.25	4.09	4.08
3,	4.48	4.09	4.08
4,	4.38	3.99	3.98
5,	3.92	3.99	4.08
6,	3.80	3.89	3.98
7,	3.80	3.89	4.48
8,	3.70	3.89	4.58
9,	3.70	a5.49	4.28
10,	3.70	5.99	4.18
11,	3.70	5.09	4.08
12,	3.70	4.79	4.28
13,	3.78	4.89	4.28
14,	3.70	4.99	4.28
15,	3.65	4.69	4.18
16,	3.60	4.69	3.98
17,	3.60	4.69	3.98
18,	3.60	4.49	4.08
19,	3.60	4.49	4.08
20,	4.85	4.39	3.98
21,	4.55	4.29	3.98
22,	4.20	4.19	3.98
23,	4.20	4.19	3.88
24,	4.20	4.09	3.98
25,	4.20	4.09	3.98
26,	4.90	3.99	3.98
27,	5.15	3.99	4.08
28,	4.75	3.99	4.18
29,	4.50	4.29	3.98
30,	4.40	4.19	3.98
31,	4.30	....	3.88

Note.—a=Max. 6.39′ at 5 P. M.

WEST BRANCH OF SUSQUEHANNA RIVER.

DESCRIPTION OF BASIN.

The West Branch of the Susquehanna river, which joins the North Branch at Northumberland, to form the main Susquehanna river, drains a total area of approximately 6,980 square miles, lying entirely within the State. This branch rises in the west central part of the State in the northwestern corner of Cambria county, and flows northward a short distance and then, turning in a general northeasterly direction, continues to below Renovo, Clinton county, where it takes an easterly course to the mouth of Loyalsock creek, and thence turns southward to its junction with the North Branch at Northumberland. The total length of this stream, from its headwaters to its mouth is about 226 miles. The West Branch of the Susquehanna river is unique among Pennsylvania rivers, in that it has numerous large tributaries, several of which join the river above Williamsport, which is 41 miles above the mouth.

The headwaters in Cambria and Clearfield counties lie in a rich, bituminous coal mining area, the country being thickly settled and dotted with boroughs and villages. Some farming is carried on in this area, and the mountains are partly covered with second growth timber. From Clearfield to Lock Haven the basin is sparsely settled, little farming being carried on, and the country in general is rough and rugged, the hills being well covered with second growth timber. From Lock Haven to the mouth the drainage basin is well settled along the main stream, and most of the tributaries. Considerable farming is carried on in the valleys, but the mountains are rugged and covered with second growth.

The entire drainage basin is mountainous and rugged, and the river from its headwaters follows a winding course, through a narrow channel, hemmed in by the hills and mountains, parallel to and west of the Backbone Ridge of the Allegheny Mountains, cutting through the mountains as it turns southward at Halls. The slope of the headwaters is steep, the river often falling at the rate of eight feet per mile to Keating, but from this point the slope becomes less steep, falling to the mouth at an average rate of two and one-half feet per mile. Only a small section of the northeastern corner of this basin lies within the glacial area. Extensive limestone areas underlie some of the tributaries which lie to the south of the main stream.

The principal tributaries are Clearfield, Moshannon, Sinnemahoning, Kettle, Bald Eagle, Pine, Lycoming and Loyalsock creeks.

The principal towns in the basin are Williamsport and Lock Haven cities. Many domestic water supplies are obtained from the tributaries of the stream, but only a few from the parent stream.

The northern portion of the basin is subject to a mean annual precipitation of 35 to 40 inches, and the southern part from 40 to 45 inches.

The discharge has been measured since October 1, 1913, at Bower, since October 1, 1905 at Renovo, and since March 1, 1895, at Williamsport.

In October, 1913, flood warning stations were also established on the West Branch at Clearfield, Jersey Shore, Lock Haven, and Lewisburg, where daily gage heights are obtained.

SUSQUEHANNA BASIN—STATION NO. 10.

WEST BRANCH OF SUSQUEHANNA RIVER AT BOWER, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, about 4 miles below Mahaffey, at Bower, Clearfield county.

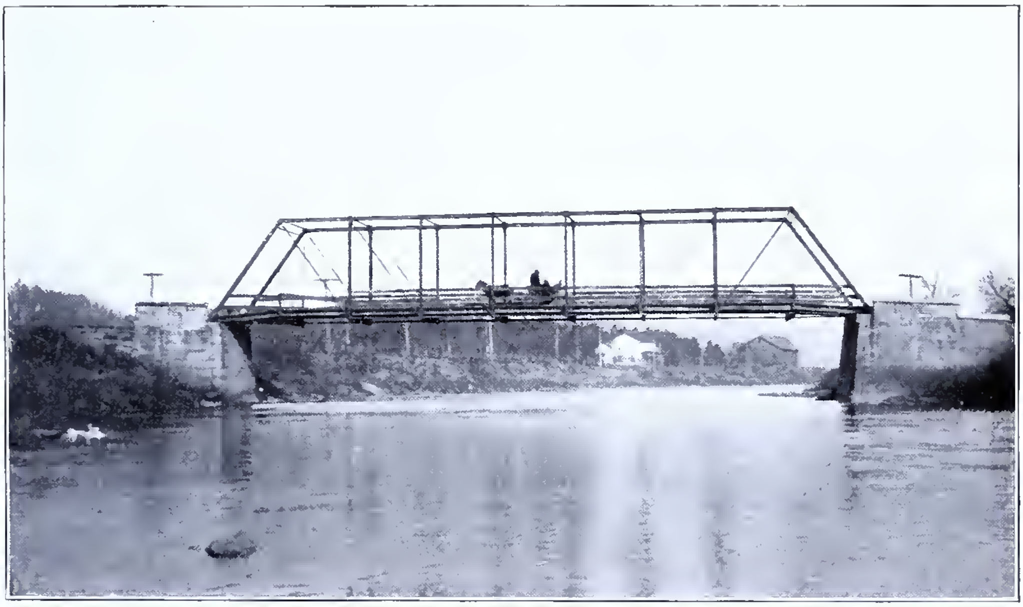
RECORDS AVAILABLE—Discharge measurements and gage heights from October 2 to December 31, 1913.

DRAINAGE AREA—320 square miles.

GAGE—A standard chain gage is attached to the wooden handrail on the downstream side of the bridge. The elevation of zero is arbitrary datum. The length of chain from the bottom of the weight to the marker is 28.72 feet. Bench Mark No. 1 is a cross cut on face of right downstream concrete wingwall, 13 feet down from top of coping and 19 feet from end of wall, elevation 12.16 feet above gage datum. The gage is read twice daily by A. T. Bell.

DISCHARGE MEASUREMENTS—Taken from the downstream side of bridge. The initial point for soundings is the top face of the left abutment.

CHANNEL—The channel above the bridge first curves to the left and then to the right as it approaches the bridge, passes under the bridge at right angles, and then curves to the right immediately below the same. The right bank is low and subject to overflow during extreme high stages, while the left bank is high and not subject to overflow. The bed is composed of gravel.



Gaging Station on West Branch Susquehanna River, at Bower.

DISCHARGE MEASUREMENTS OF WEST BRANCH SUSQUEHANNA RIVER, AT BOWER, CLEARFIELD COUNTY, PA.

(Drainage area 320 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
1	Oct. 1	Hosmer,	117	509	1.04	5.78	530	0.6 msmt.
2	Nov. 8	Boehringer,	116	396	0.45	4.88	179	0.6 msmt.
3	Dec. 4	Hosmer,	115	437	0.64	5.26	279	0.6 msmt.

DAILY MEAN GAGE HEIGHTS OF WEST BRANCH SUSQUEHANNA RIVER AT BOWER, CLEARFIELD COUNTY, PA.

1913.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.
1,	....	5.54	5.31
2,	5.56	5.30	5.32
3,	6.53	5.16	5.28
4,	6.53	5.12	5.28
5,	5.08	5.08	5.21
6,	4.86	4.96	5.13
7,	4.80	4.86	6.04
8,	4.61	4.78	6.74
9,	4.50	7.27	6.29
10,	4.42	9.20	6.02
11,	4.38	7.40	5.90
12,	4.42	6.72	5.78
13,	4.38	7.07	5.66
14,	4.32	7.52	5.54
15,	4.26	7.16	5.48
16,	4.22	6.92	5.37
17,	4.14	6.78	5.26
18,	4.18	6.32	5.12
19,	4.23	6.08	4.98
20,	6.50	6.04	4.82
21,	6.05	5.72	5.04
22,	5.52	5.56	5.04
23,	5.30	5.44	4.95
24,	5.47	5.36	5.12
25,	7.06	5.22	5.18
26,	7.84	5.14	4.98
27,	7.25	5.08	5.26
28,	6.56	5.05	5.34
29,	6.13	5.40	5.24
30,	5.86	5.35	5.10
31,	5.78	....	5.16

SUSQUEHANNA BASIN—STATION NO. 11.

WEST BRANCH SUSQUEHANNA RIVER AT CLEARFIELD, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, steel, through-truss highway bridge at Clearfield, Clearfield county.

RECORDS AVAILABLE—Gage heights from October 2, to December 31, 1913. Prior to this gage heights have been obtained since May 1, 1902, by the U. S. Weather Bureau.

DRAINAGE AREA—485 square miles.

GAGE—A staff gage is fastened on the downstream side of the pier. The elevation of zero is 1094.8 feet above mean sea level. Bench Mark No. 1 is top of rail at P. R. R. Station, elevation 12.2 feet above gage datum. Bench Mark No. 2 is top of rail at N. Y. C. Railroad Station, elevation 10.2 feet above gage datum. The gage is read once daily by H. P. Bridge.

CHANNEL—The channel is straight above and below the station for several hundred feet. Both banks are high and not subject to overflow.

DAILY MEAN GAGE HEIGHTS OF WEST BRANCH SUSQUEHANNA RIVER AT CLEARFIELD, CLEARFIELD COUNTY, PA.

1913.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.
1,	....	1.55	1.50
2,	1.80	1.50	1.40
3,	1.95	1.40	1.40
4,	1.95	1.40	1.40
5,	1.65	1.35	1.40
6,	1.50	1.30	1.40
7,	1.35	1.30	1.55
8,	1.30	1.20	2.50
9,	1.30	2.00	2.05
10,	1.30	4.75	1.80
11,	1.30	3.20	1.80
12,	1.30	2.55	1.80
13,	1.30	2.40	1.80
14,	1.30	3.10	1.70
15,	1.20	2.90	1.60
16,	1.20	2.60	1.50
17,	1.20	2.60	1.40
18,	1.20	2.25	1.40
19,	1.20	2.05	1.40
20,	1.75	1.90	1.35
21,	2.25	1.80	1.30
22,	1.85	1.70	1.30
23,	1.70	1.60	1.30
24,	1.65	1.50	1.30
25,	2.60	1.50	1.30
26,	2.45	1.40	1.30
27,	2.75	1.40	Frozen
28,	2.25	1.40	"
29,	2.05	1.40	"
30,	1.75	1.60	"
31,	1.60	....	"

Gaging Station on Clearfield Creek, at Dimeling.

CLEARFIELD CREEK.

DESCRIPTION OF BASIN.

Clearfield creek, one of the largest tributaries of the upper West Branch of the Susquehanna river, drains an area of approximately 396 square miles. Rising in the heart of the Allegheny mountains, at Noel, Cambria county, the creek flows in a general northeasterly course 18 miles to Frugality, Cambria county, where it turns and follows a northwesterly direction for 11 miles to Irvona, Clearfield county. From Irvona to Madera the creek again flows in a northeasterly direction for 10 miles and then turns, following a tortuous course in a northerly direction for 21 miles to its mouth about 3 miles below Clearfield.

From its headwaters to Coalport, Clearfield county, the main stream passes through a sparsely inhabited region whose hillsides are high and steep and largely deforested, while the only towns in this section are located in the creek valley. From Coalport to Madera the valleys of the creek and its tributaries are more thickly populated, and considerable coal mining is carried on.

After the stream passes Madera, it flows through a narrow, practically uninhabited valley, to its junction with Little Clearfield creek at Dimeling, below which the valley again widens out to a small extent. Little Clearfield creek, its principal tributary, parallels the river for 17 miles, draining a mountainous and sparsely inhabited region.

The principal towns in this watershed are Irvona, Coalport and Madera. The fall of the stream is rapid throughout its course and is at the rate of approximately 16 feet per mile.

Clearfield creek drains the northeast section of Cambria, and the southcentral part of Clearfield counties, where the mean annual precipitation is 45 to 50 inches.

The discharge has been measured since October 2, 1913, at Dimeling, 7½ miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 12.

CLEARFIELD CREEK AT DIMELING, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, at Dimeling, Clearfield county.

RECORDS AVAILABLE—Discharge measurements and gage heights from October 2 to December 31, 1913.

DRAINAGE AREA—370 square miles.

GAGE—A standard chain gage is attached to the upstream wooden handrail. The elevation of zero is arbitrary. The length of chain from bottom of weight to the marker is 27.96 feet. Bench Mark No. 1 is extreme outer corner of first projecting course from top of left upstream wingwall, elevation 17.51 feet above gage datum. The gage is read twice daily by G. S. Stover.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, the distance between abutments being 174 feet. The initial point for soundings is face of left abutment.

CHANNEL—The channel above the station is straight for 100 feet, with a reverse curve from left to right above. Below the station it is straight for 200 feet and then curves to the right. The right bank is low and subject to overflow during extreme high stages. The left bank is high and not subject to overflow. The bed is composed of gravel and rock, and there is a good velocity at all stages.

REMARKS—Little Clearfield creek enters 400 feet upstream.

DISCHARGE MEASUREMENTS OF CLEARFIELD CREEK, AT DIMELING, CLEARFIELD COUNTY, PA.

(Drainage area 370 square miles.)

No.	Date.		Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
1	Oct.	2	Hosmer, ...	132	440	1.67	5.68	734	0.6 method.
2	Nov.	9	Boehringer, ...	128	351	1.20	5.10	422	0.6 method.
3	Dec.	5	Hosmer, ...	126	323	0.97	4.84	312	0.6 method.

DAILY MEAN GAGE HEIGHTS OF CLEARFIELD CREEK AT DIMELING, CLEARFIELD COUNTY, PA.

1913.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.
1,	....	5.31	5.02
2,	5.52	5.10	4.98
3,	5.76	4.96	4.97
4,	5.40	4.89	4.90
5,	4.90	4.76	4.82
6,	4.56	4.67	4.78
7,	4.36	4.56	6.50
8,	4.24	4.43	6.29
9,	4.18	6.52	5.76
10,	4.11	9.22	5.51
11,	4.10	7.34	5.49
12,	4.20	6.61	5.16
13,	4.56	6.53	5.24
14,	4.25	6.73	5.17
15,	4.11	6.45	5.10
16,	4.00	6.82	4.96
17,	3.97	6.31	4.88
18,	4.04	5.94	4.86
19,	4.45	5.75	4.76
20,	7.10	5.62	4.58
21,	6.64	5.44	4.62
22,	5.92	5.28	4.64
23,	5.41	5.14	4.58
24,	5.44	5.05	4.68
25,	7.15	4.90	4.88
26,	7.72	4.81	4.76
27,	7.42	4.80	4.59
28,	6.53	4.75	4.64
29,	6.16	5.01	4.82
30,	5.75	5.16	5.38
31,	5.55	....	5.23

MOSHANNON CREEK.

DESCRIPTION OF BASIN.

Moshannon creek is one of the large tributaries of the West Branch of the Susquehanna river and rises in Blair county. about one mile south of the southwest corner of Centre county. The creek follows a circuitous course. its total length being about 49 miles, with all but the first mile of it forming the boundary between Clearfield and Centre counties, and has a drainage area of 288 square miles.

The creek flows in a general northeasterly course from its source to Viaduct, after which it follows a northerly direction to its mouth, three miles above Karthaus, Clearfield county. There are many tributaries, both in Centre and Clearfield counties, those rising in the latter county finding their source in the extreme northwestern range of the Allegheny mountains; the tributaries are all typical mountain streams with rapid falls and variable flows.

Mining is carried on along the Moshannon creek and its tributaries, and the majority of the latter are polluted with mine waste. On the upper 15 miles of this stream the hills have been deforested for mining purposes, for a distance of from 1 to 2 miles on either side of the creek and are now covered with a second growth. Below Peale, the stream enters a narrow, precipitous valley and flows through a timbered section sparsely populated, with no railroad following its banks. Above Peale, however, the Pennsylvania Railroad and the New York Central and Hudson River Railroad follow the creek.

The most important towns along this creek are Osceola, South Philipsburg, Philipsburg and Houtzdale. The water of the stream and its tributaries is used to some extent for domestic and industrial purposes. Little water power is developed, although on its tributaries there are numerous locations where good power could be obtained.

The mean annual precipitation over this watershed is from 35 inches in the lower portion to 40 inches in the upper part. The discharge of Moshannon creek has been measured since October 3, 1913. at Winburne, Clearfield county.

SUSQUEHANNA BASIN—STATION NO. 13.

MOSHANNON CREEK AT WINBURNE, PA.

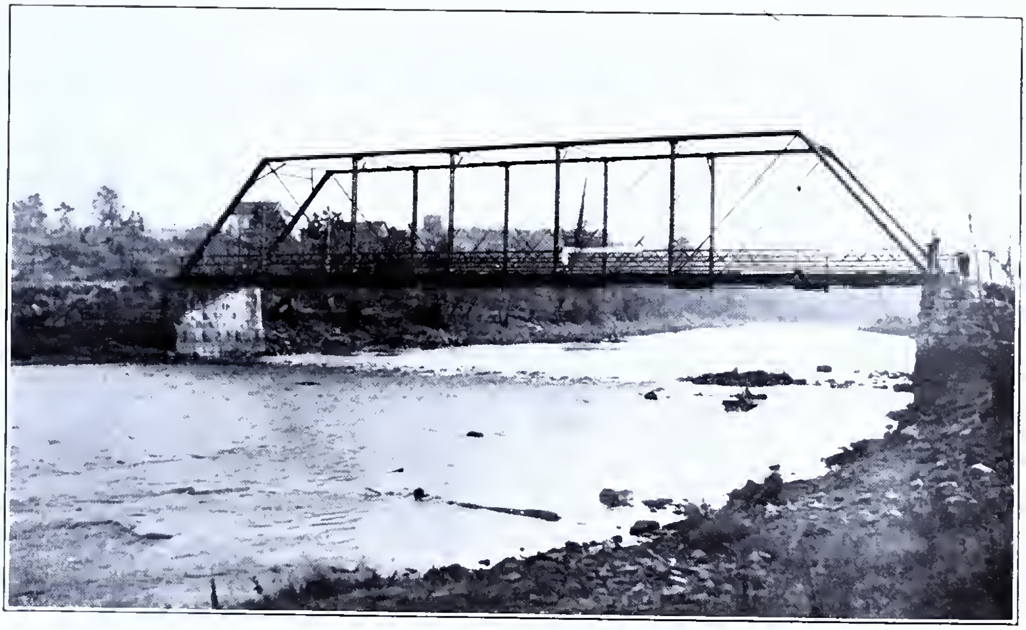
DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, at Winburne, Clearfield county.

RECORDS AVAILABLE—Discharge measurements and gage heights from October 4 to December 31, 1913.

DRAINAGE AREA—150 square miles.

GAGE—A standard chain gage is attached to the angle iron handrail, downstream side. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 17.20 feet. Bench Mark No. 1 is the corner of the 4th course below the bridge seat, left downstream wingwall, elevation 6.58 feet above gage datum. The gage is read twice daily by W. M. Hoover.



Gaging Station on Moshannon Creek at Winburne.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is left end of downstream handrail.

CHANNEL—The channel is straight above and below the station. The right bank is high, and the left bank is low and subject to overflow at times of extreme high water. The bed is composed of gravel. The velocity is good under the bridge at all stages.

DISCHARGE MEASUREMENTS OF MOSHANNON CREEK, AT WINBURNE, CLEARFIELD COUNTY, PA.

(Drainage area 150 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
1	Aug. 20	Reckord & Hosmer,..	82	53	0.89	0.60	47	Integration method.
2	Oct. 3	Hosmer, ...	98	92	1.83	0.91	170	0.6 method.
3	Nov. 10	Boehringer, ...	109	281	4.04	2.67	1136	Surface msmt.
4	Nov. 10	Boehringer, ...	109	303	4.28	2.92	1298	Surface msmt.
5	Dec. 5	Hosmer, ...	108	100	1.57	0.94	156	0.6 method.

DAILY MEAN GAGE HEIGHTS OF MOSHANNON CREEK AT WINBURNE, CLEARFIELD COUNTY, PA.

1913.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.
1,	....	1.10	1.04
2,	....	1.00	1.05
3,	0.91	0.97	1.06
4,	0.80	0.94	0.98
5,	....	0.94	0.94
6,	....	0.94	0.95
7,	....	0.93	1.10
8,	0.65	0.92	1.16
9,	0.65	1.80	1.14
10,	0.62	2.76	1.24
11,	0.62	2.47	1.12
12,	0.68	1.97	1.19
13,	0.80	1.80	1.09
14,	0.60	1.90	1.07
15,	0.65	1.80	1.06
16,	0.61	1.62	1.01
17,	0.61	1.60	1.00
18,	0.64	1.50	1.00
19,	0.64	1.47	1.00
20,	1.49	1.42	1.00
21,	1.77	1.36	0.98
22,	1.17	1.24	0.91
23,	1.01	1.26	0.90
24,	1.51	1.17	1.00
25,	1.54	1.13	1.00
26,	1.65	1.10	1.00
27,	1.49	1.08	1.05
28,	1.41	1.08	*1.10
29,	1.29	1.08	*1.24
30,	1.24	1.05	*1.14
31,	1.18	....	*1.01

Note—*Creek partly frozen.

DRIFTWOOD BRANCH OF SINNEMAHONING CREEK.

DESCRIPTION OF BASIN.

The Driftwood Branch of Sinnemahoning creek rises in the northeast corner of Elk county on the eastern slope of the Allegheny mountains, and drains an area of approximately 316 square miles. It flows in a general southeasterly direction through Elk county to the Elk-Cameron county line, from which point it turns in a general easterly direction to Emporium, thence follows a southerly course to its junction with the Bennett Branch at Driftwood, forming the main Sinnemahoning creek, a total distance of 30 miles. This stream drains the entire northern and central parts of Cameron county, as well as a portion of the western section, having many tributaries, the largest of which are West and Clear creeks, and the Portage Branch. Since the stream passes through a rough, uninhabited valley throughout most of its course, there are but a few small towns and villages in this watershed, the largest of which is Emporium. The hillsides are covered with second growth timber, and industries in this valley have not been developed extensively, although there is some mining and lumbering.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since September 30th, 1913, at Sterling Run, about 9 miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 14.

DRIFTWOOD BRANCH SINNEMAHONING CREEK AT STERLING RUN, PA.

DESCRIPTION OF STATION.

LOCATION—On three span, steel, through truss, highway bridge, about 9 miles above the mouth at Sterling Run, Cameron county.

RECORDS AVAILABLE—Discharge measurements and gage heights from September 30, to December 31, 1913.

DRAINAGE AREA—270 square miles.

GAGE—A standard chain gage is attached to the downstream handrail, in third span. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 18.82 feet. Bench Mark No. 1 is a berm cut on the face of the 5th course from top of right downstream wingwall, 0.4 feet from top of course, 0.6 feet from end of wall, elevation 7.15 feet above gage datum. The gage is read twice daily by Thomas Eddy.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading during low water at a section 50 feet below the bridge. The initial point for soundings is face of left abutment.

CHANNEL—The channel is straight above and below the bridge for 1,000 feet and 300 feet respectively. There is a riffle 25 feet above the bridge. Both banks are low and subject to overflow during extreme high stages. The bed is composed of gravel, and there is a good velocity at all stages.

REMARKS—Sterling Run enters the stream about 700 feet below the station.

DISCHARGE MEASUREMENTS OF DRIFTWOOD BRANCH SINNEMAHONING CREEK, AT STERLING RUN, CAMERON COUNTY, PA.

(Drainage area 270 square miles.)

No.	Date.		Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
1	Sept.	30	Hosmer,	83	39	0.51	0.71	20	Surf. and 0.6 method.
2	Nov.	7	Boehringer,	192	169	0.92	1.26	156	0.6 method.
3	Dec.	3	Hosmer,	198	214	1.15	1.38	247	0.6 method.

DAILY MEAN GAGE HEIGHTS OF DRIFTWOOD BRANCH SINNEMAHONING CREEK AT STERLING RUN, CAMERON COUNTY, PA.

1913.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.
1,	2.12	1.52	1.36
2,	1.78	1.43	1.36
3,	1.64	1.39	1.38
4,	1.38	1.34	1.36
5,	1.20	1.28	1.34
6,	1.06	1.21	1.35
7,	1.01	1.19	1.43
8,	0.98	1.21	1.76
9,	0.97	2.16	1.69
10,	0.95	3.28	1.69
11,	1.01	2.71	1.67
12,	1.24	2.26	1.69
13,	1.13	2.02	1.65
14,	1.08	2.20	1.59
15,	1.00	2.23	1.49
16,	0.96	2.20	1.41
17,	0.94	2.08	1.37
18,	0.91	1.94	1.41
19,	1.04	1.84	1.40
20,	2.06	1.76	1.39
21,	1.88	1.66	1.41
22,	1.77	1.52	1.36
23,	1.56	1.47	1.35
24,	1.52	1.43	1.37
25,	2.40	1.40	1.35
26,	2.44	1.39	1.36
27,	2.34	1.38	1.37
28,	2.07	1.39	1.39
29,	1.88	1.41	1.39
30,	1.76	1.36	1.43
31,	1.66	....	1.50

KETTLE CREEK.

DESCRIPTION OF BASIN.

Kettle creek, an important tributary of the West Branch of the Susquehanna river, drains an area of approximately 240 square miles. Rising in the southern part of Potter county in many branches, which converge near the Potter-Clinton county line, the stream flows in a general southwesterly direction to Leidy, Clinton county, when it turns in a southerly and then southeasterly direction to its mouth at Westport, Clinton county, about 6 miles above Renovo, its total length being approximately 39 miles.

From the headwaters to Cross Forks, Potter county, the creek flows through a rough, uninhabited valley, the bordering hillsides being steep and precipitous. From Cross Forks to a short distance below Leidy, the sparsely inhabited valley widens and some agriculture is carried on. From this point to the mouth the hills converge until the creek passes through a deep, narrow valley for its last 7 miles. The hills in this lower section are high and continuous, the slopes steep and the hillsides covered with second growth timber. The fall of the stream is rapid, with numerous riffles and falls throughout its entire length and, above Cross Forks, the main stream is unpolluted.

The creek is not used for domestic water supply, and only to a slight degree for water power.

The mean annual precipitation over this watershed is from 35 to 40 inches.

The discharge has been measured since December 2, 1913, at Leidy, Clinton county, about 11 miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 15.

KETTLE CREEK, AT LEIDY, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, through-truss, highway bridge, at Leidy, Clinton county.

RECORDS AVAILABLE—Discharge measurements and gage heights from December 2 to 31, 1913.

DRAINAGE AREA—202 square miles.

Gaging Station on Kettle Creek, at Leidy.

GAGE—A standard chain gage is attached to the handrail on the upstream side of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 18.43 feet. Bench Mark No. 1 is the outside top corner of the third course below bridge seat, on upstream left wingwall, elevation 11.335 feet above gage datum. The gage is read twice daily by C. W. Sliker.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the highway bridge, the initial point for soundings being the left end of lower pipe rail.

CHANNEL—The channel above and below the station is straight for several hundred feet. The right bank is high and steep, and the left bank is low with gradual slopes, but not subject to overflow. The bed is composed of clean gravel, and there is a good velocity at all stages.

DISCHARGE MEASUREMENTS OF KETTLE CREEK, AT LEIDY, CLINTON COUNTY, PA.

(Drainage area 202 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
1	1913 Dec. 2	Hosmer, ...	126	207	0.85	2.37	176	0.6 msmt.

DAILY MEAN GAGE HEIGHTS OF KETTLE CREEK AT LEIDY, CLINTON COUNTY, PA.

1913. DAY.	DEC. G. H.
1,	....
2,	2.37
3,	2.32
4,	2.30
5,	2.29
6,	2.29
7,	2.68
8,	3.10
9,	3.20
10,	3.08
11,	3.02
12,	2.94
13,	2.76
14,	2.66
15,	2.58
16,	2.50
17,	2.44
18,	2.38
19,	2.32
20,	2.29
21,	2.27
22,	2.22
23,	2.28
24,	2.40
25,	2.45
26,	2.60
27,	2.37
28,	2.22
29,	2.34
30,	2.45
31,	2.34

SUSQUEHANNA BASIN—STATION NO. 16.

WEST BRANCH SUSQUEHANNA RIVER AT RENOVO, PA.

DESCRIPTION OF STATION.

LOCATION—On three span, steel, through-truss highway bridge, at Eighth Street, Renovo, Clinton county.

RECORDS AVAILABLE—Discharge complete from January 1, 1908, to December 31, 1913.

DRAINAGE AREA—2,990 square miles.

GAGE—A standard chain gage is fastened to the upstream handrail near the north pier. The elevation of zero is 637.4 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 41.04 feet. Bench Mark No. 1 is the southwest corner of the north abutment of the bridge, chiseled in stone face 10 feet above low water mark, established from P. R. R. gage on north pier, elevation 647.4 feet above mean sea level, or 10 feet above zero of gage. Bench Mark No. 2 is a one inch offset in the upstream corner of the north concrete abutment, one foot above the bottom, with the corner above the projection chiseled out and having an elevation of 645.44 feet above mean sea level, or 8.04 feet above zero of gage. Bench Mark No. 3 is a chiseled rod seat on a projection in the 11th course down from the bridge seat on the southwest end of the stone work of the north abutment, 6 inches below a chiseled arrow head, elevation 648.17 feet above mean sea level, or 10.77 feet above zero of gage. The gage is read twice daily by H. L. Baird.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. During low stages by wading at section 2,000 feet above bridge at foot of 3rd Street. The initial point for soundings is the end of handrail, left downstream side.

CHANNEL—The channel above the station is straight for 1,000 feet and it is also straight for 3,000 feet below. Both banks are high and not subject to overflow. The bed is composed of rocks and gravel.

DISCHARGE MEASUREMENTS OF WEST BRANCH SUSQUEHANNA RIVER, AT RENOVO, CLINTON COUNTY, PA.

(Drainage area 2990 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
19	Sept. 9	Hosmer, ...	387	1401	0.24	—0.46	334	Surface & 0.6 msmt.
20	Dec. 1	Hosmer, ...	419	2536	1.36	1.92	3450	0.6 msmt.

DISCHARGE TABLE FOR WEST BRANCH SUSQUEHANNA RIVER, AT RENOVO, CLINTON COUNTY, FROM JANUARY 1, 1908.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
—1.10	80	.80	3230	.70	11670	.60	26850	.50	47750
—1.00	100	.90	3420	.80	12060	.70	27500	.60	48600
—0.90	125	2.00	3620	.90	12460	.80	28150	.70	49500
—0.80	155	.10	3820	5.00	12860	.90	28800	.80	50400
—0.70	190	.20	4020	.10	13260	8.00	29450	.90	51300
—0.60	230	.30	4240	.20	13660	.10	30100	11.00	52250
—0.50	280	.40	4460	.30	14100	.20	30750	.10	53200
—0.40	340	.50	4690	.40	14550	.30	31400	.20	54150
—0.30	400	.60	4930	.50	15000	.40	32100	.30	55100
—0.20	470	.70	5180	.60	15500	.50	32800	.40	56050
—0.10	540	.80	5440	.70	16000	.60	33500	.50	57000
0.00	620	.90	5710	.80	16500	.70	34200	.60	58000
.10	700	3.00	5980	.90	17000	.80	34900	.70	59000
.20	790	.10	6260	6.00	17500	.90	35600	.80	60000
.30	890	.20	6540	.10	18000	9.00	36300	.90	61000
.40	1000	.30	6840	.20	18550	.10	37000	12.00	62000
.50	1120	.40	7140	.30	19100	.20	37700	.10	63000
.60	1250	.50	7440	.40	19660	.30	38450	.20	64100
.70	1390	.60	7760	.50	20225	.40	39200	.30	65200
.80	1530	.70	8080	.60	20800	.50	39950	.40	66300
.90	1680	.80	8400	.70	21400	.60	40700	.50	67400
1.00	1830	.90	8740	.80	22000	.70	41450	.60	68600
.10	1990	4.00	9080	.90	22600	.80	42200	.70	69800
.20	2150	.10	9420	7.00	23200	.90	42950	.80	71000
.30	2320	.20	9780	.10	23800	10.00	43700	.90	72200
.40	2490	.30	10140	.20	24400	.10	44450	13.00	73400
.50	2670	.40	10520	.30	25000	.20	45250		
.60	2850	.50	10900	.40	25600	.30	46050		
.70	3040	.60	11280	.50	26200	.40	46900		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF WEST BRANCH SUSQUEHANNA RIVER AT RENOVO, CLINTON COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APR.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	4.10	9420	2.80	5440	2.20	4020	4.80	12100	5.30	14100	4.70	11700	0.60	1250	0.62	1280	—0.58	240	0.17	763	2.32	4480	1.92	3460
2, ...	4.30	10100	3.30	6840	3.20	6540	4.10	9420	4.70	11700	3.70	8080	0.50	1120	0.52	1150	—0.68	198	1.32	2350	2.27	4170	1.62	2890
3, ...	2.90	5710	2.90	5710	3.00	5980	3.60	7760	3.80	8400	3.00	5980	0.50	1120	0.42	1020	—0.78	162	1.72	3080	2.17	3960	1.52	2710
4, ...	5.90	17000	2.10	3820	2.90	5710	3.00	5980	3.20	6540	2.70	5180	0.40	1000	0.42	1020	—0.78	162	2.02	3660	1.82	3270	1.47	2620
5, ...	6.20	18600	1.80	3230	2.50	4690	2.90	5710	2.90	5710	2.30	4240	0.40	1000	0.02	638	—0.98	105	1.92	3460	1.57	2800	1.42	2530
6, ...	4.90	12500	3.80	8400	2.40	4460	2.70	5180	2.60	4930	2.10	3820	2.40	4460	—0.18	484	—0.98	105	1.42	2530	1.47	2620	1.27	2270
7, ...	4.80	12100	*	3500	2.30	4240	2.60	4930	2.40	4460	2.00	3620	2.50	4690	—0.28	414	—0.98	105	1.07	1940	1.42	2530	1.32	2350
8, ...	8.90	35600	......	3500	1.80	3230	2.30	4240	2.10	3820	2.00	3620	2.50	4690	—0.28	414	—0.40	340	0.87	1640	1.42	2530	1.42	2530
9, ...	a13.45	‡78200	......	3500	1.70	3040	2.10	3820	1.90	3420	2.00	3620	2.30	4240	—0.38	352	—0.46	304	0.77	1490	1.67	2980	1.47	2620
10, ...	8.40	32100	......	3500	2.30	4240	2.00	3620	1.70	3040	2.00	3620	4.10	9420	—0.38	352	—0.44	316	0.67	1350	7.77	28000	1.57	2800
11, ...	6.50	20200	......	3500	2.30	4240	1.90	3420	1.50	2670	1.80	3230	4.30	10100	0.52	1150	—0.48	292	0.52	1150	8.22	30900	1.62	2890
12, ...	7.50	26200	......	3500	2.90	5710	1.80	3230	1.30	2320	1.70	3040	4.30	10100	0.32	912	—0.58	240	0.42	1020	6.92	22700	1.72	3080
13, ...	8.40	32100	......	3500	2.80	5440	1.80	3230	1.10	1990	0.90	1680	4.40	10500	0.52	1150	—0.43	322	—0.13	519	6.42	19800	1.47	2620
14, ...	6.90	22600	......	3500	2.90	5710	2.40	4460	1.10	1990	0.80	1530	4.50	10900	0.52	1150	—0.48	292	—0.13	519	4.87	12300	1.37	2440
15, ...	5.70	16000	......	3500	3.10	6260	2.50	4690	1.10	1990	0.80	1530	3.70	8080	0.32	912	—0.48	292	—0.28	414	4.42	10600	1.32	2350
16, ...	4.70	11700	......	3000	3.10	6260	2.50	4690	1.20	2150	0.70	1390	2.80	5440	0.22	810	—0.48	292	—0.43	322	3.82	8470	1.42	2530
17, ...	4.40	10500	......	3000	3.30	6840	2.30	4240	1.30	2320	0.70	1390	2.40	4460	0.02	638	—0.43	322	—0.48	292	3.72	8140	1.52	2710
18, ...	6.20	18600	......	3000	3.80	8400	2.20	4020	1.30	2320	0.50	1120	1.80	3230	0.02	638	—0.38	352	—0.08	556	3.32	6900	1.47	2620
19, ...	6.80	22000	......	3000	3.50	7440	2.10	3820	1.30	2320	0.40	1000	1.70	3040	—0.08	556	—0.38	352	—0.33	382	2.77	5360	1.37	2440
20, ...	6.30	19100	......	3000	3.40	7140	2.00	3620	1.20	2150	0.50	1120	1.40	2490	—0.48	292	—0.43	322	1.14	2050	2.17	3960	1.27	2270
21, ...	5.80	16500	......	3000	2.90	5710	1.80	3230	1.10	1990	0.90	1680	1.40	2490	—0.78	162	—0.43	322	3.42	7200	1.62	2890	1.27	2270
22, ...	5.20	13700	......	3000	2.80	5440	1.70	3040	0.90	1680	1.00	1830	1.30	2320	—0.88	131	—0.03	596	3.62	7820	1.62	2890	1.27	2270
23, ...	5.00	12900	......	3000	2.70	5180	1.50	2670	1.10	1990	1.20	2150	0.90	1680	—0.28	414	0.12	718	3.12	6320	1.52	2710	1.32	2350
24, ...	6.10	18000	†8.30	31400	2.60	4930	1.40	2490	2.10	3820	1.00	1830	1.00	1830	—0.18	484	0.12	718	3.12	6320	1.52	2710	1.52	2710
25, ...	6.80	22000	2.00	3620	5.90	17000	1.30	2320	1.90	3420	0.80	1530	3.00	5980	—0.28	414	0.12	718	2.72	5230	1.47	2620	1.62	2890
26, ...	6.50	20200	1.70	3040	9.67	41200	1.30	2320	2.90	5710	0.70	1390	3.20	6540	—0.38	352	0.12	718	4.97	12700	1.42	2530	1.72	3080
27, ...	5.70	16000	1.50	2670	b12.16	63700	1.30	2320	3.10	6260	0.70	1390	2.10	3820	—0.38	352	0.02	636	5.22	13700	1.42	2530	1.82	3270
28, ...	4.40	10500	1.60	2850	11.80	60000	3.90	8740	6.80	22000	0.60	1250	1.40	2490	—0.68	198	0.02	636	4.57	11200	1.52	2710	1.57	2800
29, ...	3.90	8740	......	......	8.40	32100	7.50	26200	8.30	31400	0.60	1250	2.00	3620	—0.28	414	0.02	636	3.67	7980	1.72	3080	*	2700
30, ...	3.30	6840	......	......	6.50	20200	6.60	20800	8.00	29400	0.60	1250	1.80	3230	—0.28	414	—0.48	292	3.02	6040	1.62	2890	....	2700
31, ...	3.00	5980	......	......	5.40	14600	....	......	5.30	14100	....	......	1.00	1830	—0.28	414	......	....	2.62	4980	....	......	....	2700

Notes.—a Max. 14.90, = 95200 sec. ft. b Max. 12.80: = 71000 sec. feet. ‡Estimated. *River frozen Feb. 7-23 and Dec. 29-31. †Ice moved out and discharge estimated from climatological records.

ESTIMATED MONTHLY DISCHARGE OF WEST BRANCH SUSQUEHANNA RIVER, AT RENOVO, CLINTON COUNTY, PA.

(Drainage area 2990 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	95,200	5,710	18,800	6.288	7.250
February,	31,400	....	4,730	1.582	1.647
March,	71,000	3,040	12,200	4.080	4.704
April,	26,200	2,320	5,880	1.967	2.195
May,	31,400	1,680	6,780	2.268	2.615
June,	11,700	1,000	2,870	0.960	1.071
July,	10,900	1,000	4,420	1.478	1.704
August,	1,280	131	616	0.206	0.238
September,	718	105	370	0.124	0.138
October,	13,700	292	3,840	1.284	1.480
November,	30,900	2,530	7,130	2.385	2.661
December,	....	....	2,660	0.890	1.026
The year,	95,200	105	5,860	1.959	26.729

Note.—River frozen Feb. 7-23 and Dec. 29-31 inclusive, and discharge estimated from climatological records.

BALD EAGLE CREEK.

DESCRIPTION OF BASIN.

Bald Eagle creek, a large tributary of the West Branch of the Susquehanna river in Centre and Clinton counties, drains an area of approximately 780 square miles. Rising on the southern boundary on the western part of Centre county, it flows northeasterly through an agricultural valley, the adjacent hills being covered with second growth timber. The valley gradually widens to a considerable breadth as the stream enters Clinton county, continuing to its mouth at Lock Haven, the total length being about 50 miles, and the watershed oval in shape. The valleys in this basin are extensively farmed and contain numerous boroughs and villages, while the bordering ridges are nearly all covered with heavy second growth. This creek rises at an elevation of approximately 1,100 feet and, in a distance of about 23 miles to Milesburg, falls at the rate of 18 feet per mile; from this point to the mouth the slope is approximately five feet per mile. The principal tributaries are Fishing, Beech and Spring creeks. Spring and Fishing creeks enter from the south, draining a limestone section, and their well maintained dry weather flow aids largely in making the discharge of Bald Eagle creek, in such seasons, a most important affluent of the West Branch. Many of the smaller tributaries are used for domestic water supply, nearly all the boroughs and larger villages being so equipped.

The mean annual precipitation over the greater portion of the watershed is from 40 to 45 inches.

The Water Supply Commission of Pennsylvania maintains three gaging stations in this basin,—at Beech Creek Station, at Milesburg, and on Spring creek near Bellefonte. A gaging station at Castanea, one mile above the mouth, was formerly operated by this Commission, but, on account of being influenced by backwater from the West Branch of the Susquehanna river during medium and high stages, was discontinued.

SUSQUEHANNA BASIN—STATION NO. 17.

BALD EAGLE CREEK AT MILESBURG, PA.

DESCRIPTION OF STATION.

LOCATION—On Pennsylvania Railroad bridge No. 53, 300 yards above mouth of Spring creek, at Milesburg, Centre county.

RECORDS AVAILABLE—Discharge complete from February 6, 1911, to December 31, 1913.

DRAINAGE AREA—140 square miles.

GAGE—A 10 foot staff gage is fastened to the downstream side of the bridge. The elevation of zero is arbitrary. Bench Mark No. 1 is cross "X" on top of 4th step from top of left downstream wing-wall, 1.7 feet in from end of step, elevation 6.655 feet above gage datum. The gage is read twice daily by P. H. Haupt.

DISCHARGE MEASUREMENTS—Taken from downstream side of railroad bridge, and by wading during low stages. The initial point for soundings is face of left abutment under downstream guard-rail along tracks.

CHANNEL—The channel above the station is straight for 300 feet. Below the station there is a slight bend to the northwest for about 500 feet. The right bank is high, steep, and rocky, and the left bank is low, but railroad embankment prevents floods going around the bridge. The bed is composed of gravel and stone.

DISCHARGE MEASUREMENTS OF BALD EAGLE CREEK, AT MILESBURG, CENTRE COUNTY, PA.

(Drainage area 140 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913.		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
10	Sept. 10	Hosmer, ...	30	9	0.39	0.14	3.5	Wading measurement 300 feet above bridge.
11	Dec. 5	Reckord & Shade, ...	82	167	0.39	0.95	65	0.6 measurement.

DISCHARGE TABLE FOR BALD EAGLE CREEK, AT MILESBURG, CENTRE COUNTY, FROM FEB. 6, 1911.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
0.10	1	.10	105	.10	420	.10	1110	.10	2430
.20	3	.20	125	.20	470	.20	1220	.20	2580
.30	6	.30	145	.30	525	.30	1340	.30	2740
.40	13	.40	170	.40	580	.40	1460	.40	2900
.50	21	.50	195	.50	640	.50	1590	.50	3060
.60	31	.60	225	.60	700	.60	1720	.60	3220
.70	43	.70	260	.70	770	.70	1850	.70	3390
.80	57	.80	295	.80	840	.80	1990	.80	3560
.90	71	.90	335	.90	920	.90	2130	.90	3730
1.00	87	2.00	375	3.00	1010	4.00	2280	5.00	3900

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BALD EAGLE CREEK AT MILESBURG, CENTRE COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	0.58	29	1.48	190	......	100	1.74	274	1.80	295	1.61	228	0.44	16	0.45	17	0.15	2	0.82	60	0.92	74	1.05	96
2,	0.55	26	1.20	125	......	100	1.60	225	1.60	225	1.41	172	0.43	15	0.38	12	0.15	2	0.75	50	0.84	63	1.04	94
3,	1.92	343	1.15	115	......	100	1.44	180	1.40	170	1.24	133	0.40	13	0.35	10	0.14	2	0.58	29	0.78	54	1.02	91
4,	2.52	652	*	100	......	100	1.35	158	1.32	150	1.12	109	0.38	12	0.33	8	0.13	2	0.48	19	0.74	49	0.98	84
5,	1.96	359	......	100	......	100	1.26	137	1.24	133	1.00	87	1.86	319	0.32	7	0.13	2	0.38	12	0.70	43	0.96	81
6,	1.79	292	......	100	......	100	1.16	117	1.06	98	0.90	71	1.94	351	0.30	6	0.13	2	0.32	7	0.66	38	0.95	79
7,	2.35	552	......	100	......	100	1.12	109	1.05	96	0.86	65	1.02	91	0.30	6	0.16	2	0.28	5	0.64	36	1.72	267
8,	4.30	2740	......	100	......	100	1.06	98	0.95	79	0.82	60	0.74	49	0.30	6	0.34	9	0.25	4	0.60	31	2.00	375
9,	3.00	1010	......	100	......	100	1.02	91	0.88	68	0.80	57	0.80	57	0.30	6	0.22	4	0.23	4	e2.85	880	1.70	260
10,	2.28	514	......	100	......	100	0.94	77	0.84	63	0.74	49	2.10	420	0.32	7	0.15	2	0.23	4	3.10	1110	1.54	207
11,	2.58	688	......	100	1.54	207	1.16	117	0.82	60	0.67	39	1.18	121	0.38	12	0.13	2	0.24	4	2.12	430	1.42	175
12,	3.08	1090	......	100	1.30	145	1.56	213	0.76	51	0.64	36	1.00	87	0.32	7	0.13	2	0.32	7	1.76	281	1.32	150
13,	2.55	670	......	100	1.27	139	1.33	152	0.75	50	0.60	31	0.95	79	0.28	5	0.13	2	0.27	5	1.72	267	1.22	129
14,	2.16	450	......	100	2.72	784	1.34	155	0.73	47	0.56	27	0.76	51	0.26	5	0.12	1	0.26	5	1.62	232	1.12	109
15,	1.82	303	......	100	2.52	652	1.36	160	0.72	46	0.54	25	0.66	38	0.25	4	0.10	1	0.25	4	1.55	210	1.00	87
16,	1.75	278	......	90	2.13	435	1.38	165	0.95	79	0.53	24	0.60	31	0.24	4	0.10	1	0.23	4	1.53	204	0.95	79
17,	2.52	652	......	90	1.82	303	1.28	141	0.82	60	0.52	23	0.52	23	0.23	4	0.12	1	0.22	4	1.50	195	0.92	74
18,	2.05	398	......	90	1.58	219	1.24	133	0.72	46	0.46	18	0.54	25	0.23	4	0.24	4	0.22	4	1.39	168	0.88	68
19,	2.38	569	......	90	1.46	185	1.14	113	0.65	37	0.43	15	0.50	21	0.23	4	0.23	4	0.26	5	1.28	141	0.82	60
20,	2.09	416	......	90	1.58	219	1.04	94	0.60	31	0.56	27	0.45	17	0.20	3	0.24	4	2.12	430	1.22	129	0.78	54
21,	1.91	339	......	90	1.67	250	1.00	87	0.56	27	0.82	60	0.40	13	0.18	3	0.41	14	1.40	170	1.15	115	0.75	50
22,	1.71	264	......	90	1.50	195	1.00	87	0.68	41	0.62	33	0.36	10	0.18	3	0.64	36	0.96	81	1.05	96	0.75	50
23,	1.88	327	......	90	1.35	158	0.96	81	1.02	91	0.48	19	0.56	27	0.31	7	0.34	9	0.72	46	1.00	87	0.88	68
24,	2.32	536	......	90	1.36	160	0.92	74	1.90	335	0.40	13	c2.45	610	0.28	5	0.24	4	1.22	129	0.95	79	1.58	219
25,	2.10	420	......	90	2.12	430	0.84	63	1.44	180	0.62	33	1.72	267	0.24	4	0.22	4	2.95	965	0.86	65	1.45	182
26,	1.91	339	......	90	3.22	1240	0.82	60	1.30	145	0.86	65	1.09	103	0.23	4	0.20	3	d3.94	2190	0.84	63	1.43	178
27,	1.78	288	......	90	a5.58	4900	1.32	150	2.72	784	0.95	79	0.85	64	0.22	4	0.17	2	2.62	714	0.84	63	1.40	170
28,	1.61	228	......	150	3.18	1200	2.76	812	b4.60	3220	0.71	44	0.75	50	0.20	3	0.15	2	2.04	393	0.90	71	1.36	160
29,	1.46	185	......	....	2.49	634	2.59	694	3.22	1240	0.54	25	0.65	37	0.18	3	0.13	2	1.54	207	1.22	129	1.35	158
30,	1.35	158	......	....	2.08	411	2.12	430	2.34	547	0.45	17	0.58	29	0.17	2	0.13	2	1.16	117	1.16	117	1.35	158
31,	1.46	185	......	....	1.86	319	......	....	1.88	327	......	....	0.52	23	0.15	2	......	....	1.02	91	......	....	1.35	158

Note.—*Creek frozen Feb. 4 to March 10 inclusive, and discharge estimated from climatological records. aMax. 5.9′ at 4. p. m.; 5500 sec. ft. bMax. 4.85′ at 8 a m.; 3640 sec. ft. cMax. 2.85′ at 8 a. m.; 880 sec. ft. dMax. 4.80′ at 8 a. m.; 3560 sec. ft. eMax. 4.20′ at 4 p. m.; 2580 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF BALD EAGLE CREEK, AT MILESBURG, CENTRE COUNTY, PA.

(Drainage area 140 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	2740	26	494	3.529	4.069
February,	....	....	102	0.729	0.759
March,	5500	....	458	3.271	3.771
April,	812	60	182	1.300	1.450
May,	3640	27	285	2.036	2.347
June,	228	13	56	0.400	0.446
July,	880	10	99	0.707	0.815
August,	17	2	6	0.043	0.050
September,	36	1	4	0.029	0.032
October,	3560	4	186	1.329	1.532
November,	2580	31	184	1.314	1.466
December,	375	50	135	0.964	1.111
The year,	5500	1	183	1.304	17.848

Note.—Creek frozen Feb. 4 to March 10 inclusive, and discharge estimated from climatological records.

SPRING CREEK.

DESCRIPTION OF BASIN.

Spring creek, an important tributary of Bald Eagle creek, drains an area of approximately 145 square miles, rising in the south central part of Centre county and flowing in a general northerly direction through a rich and thickly inhabitated farming section, to its mouth at Milesburg, a distance of about 20 miles, the basin being approximately pear shaped. Its course is winding, the slope being rapid at the headwaters and gradually decreasing as the mouth is reached. There are many small tributaries rising in the well timbered mountains, but throughout a stretch of ten miles of this stream, from above State College to Bellefonte, no surface tributaries enter it. Throughout this section the valley and surrounding hills are underlain with limestone, sink holes being much in evidence, and the drainage of this part of the watershed appears in numerous limestone springs close to the creek banks, the largest of which is Bellefonte Spring at Bellefonte, with a continuous flow of approximately 9,000,000 gallons daily. The dry weather flow of this creek is very large, and plays an important part in maintaining the low water flow of Bald Eagle creek. In this watershed lie State College, Bellefonte and Centre Hall boroughs, and many large farming villages, nearly all of which obtain domestic water supply from the upper tributaries of Spring creek, while the main stream is used at numerous points by small water power installations.

The watershed lies partly in an area of 35 to 40 inches, and partly in an area of 40 to 45 inches mean annual precipitation.

The discharge of this stream has been measured since February 7, 1911, about one mile below Bellefonte.

SUSQUEHANNA BASIN—STATION NO. 18.

SPRING CREEK NEAR BELLEFONTE, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, about one mile below Bellefonte, Centre Co.,

RECORDS AVAILABLE—Discharge complete from February 7, 1911 to December 31, 1913.

DRAINAGE AREA—145 square miles.

GAGE—A 10 foot staff gage is attached to the downstream side of the left abutment. The elevation of zero is arbitrary. Bench Mark No. 1 is a chiseled + mark on downstream corner of downstream edge of left abutment, elevation 7.56 feet above gage datum. The gage is read twice daily by J. H. Oliger.

DISCHARGE MEASUREMENTS—Taken from the downstream side of bridge; the initial point for soundings is the face of the left abutment, downstream side under guard rail.

CHANNEL—The channel is straight for 300 feet above the station, but there is a bend to the left 80 feet below. Both banks are flat and overflow during extreme high stages. The bed is composed of gravel and stone.

REMARKS—There is a canal about 300 feet east of the creek proper, which carries a very small part of the flow of the stream, most of which is leakage through the head gates. Discharge measurements made from the concrete bridge over the canal indicate that the mean daily discharge is approximately six cubic-feet per second during the entire year, and this has been added to the daily discharge.

DISCHARGE MEASUREMENTS OF SPRING CREEK, NEAR BELLEFONTE, CENTRE COUNTY, PA.

(Drainage area 145 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
8	Sept. 10	Hosmer, ...	87	117	1.29	1.52	151	Creek proper. 0.6 method.
	Sept. 10	Hosmer, ...	13	7	0.57	1.00	4	Canal. Surface msmt.
9	Dec. 5	Reckord & Shade, ...	86	131	1.50	1.64	196	Creek proper. 0.6 and surface msmt.
	Dec. 5	Reckord & Shade, ...	30	30	0.43	1.38	13	Canal. Surface msmt.

DISCHARGE TABLE FOR SPRING CREEK, NEAR BELLEFONTE, CENTRE COUNTY, FROM FEB. 7, 1911.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.00	87	.70	215	.40	445	.10	800	.80	1380
.10	101	.80	240	.50	485	.20	870	.90	1480
.20	116	.90	270	.60	530	.30	940	4.00	1590
.30	132	2.00	300	.70	575	.40	1010		
.40	150	.10	335	.80	625	.50	1090		
.50	170	.20	370	.90	680	.60	1180		
.60	192	.30	405	3.00	740	.70	1280		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF SPRING CREEK NEAR BELLEFONTE, CENTRE COUNTY, PA

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	1.61	200	2.10	341	1.84	258	2.50	491	2.24	390	2.08	334	1.62	203	1.68	216	1.54	185	1.55	187	1.74	231	1.80	246
2,	1.56	189	2.05	324	1.78	241	2.40	451	2.12	348	2.01	309	1.60	198	1.70	221	1.52	180	1.56	189	1.58	194	1.80	246
3,	1.85	261	2.00	306	1.74	231	2.32	419	1.94	288	1.94	288	1.60	198	1.66	212	1.54	185	1.56	189	1.68	216	1.80	246
4,	1.96	294	1.95	291	1.75	233	2.22	383	1.90	276	1.88	270	1.60	198	1.68	216	1.51	178	1.52	180	1.66	212	1.79	243
5,	1.97	297	1.91	279	1.71	223	2.20	376	1.84	258	1.81	249	1.78	241	1.68	216	1.55	187	1.51	178	1.71	223	1.72	226
6,	1.98	300	1.88	270	1.68	216	2.14	355	1.80	246	1.80	246	1.88	270	1.68	216	1.55	187	1.50	176	1.63	205	1.70	221
7,	2.16	362	1.98	300	1.60	198	2.06	327	1.81	249	1.80	246	1.70	221	1.65	209	1.56	189	1.51	178	1.64	207	1.78	241
8,	2.50	491	1.88	270	1.60	198	2.01	309	1.78	241	1.80	246	1.70	221	1.68	216	1.61	200	1.54	185	1.64	207	1.78	241
9,	2.48	483	1.82	252	1.68	216	2.00	306	1.78	241	1.76	236	1.70	221	1.64	207	1.52	180	1.51	178	2.25	393	1.81	249
10,	2.39	447	1.81	249	1.64	207	2.00	306	1.75	233	1.71	223	1.98	300	1.62	203	1.56	189	1.50	176	2.42	459	1.91	279
11,	2.49	487	1.78	241	1.82	252	2.00	306	1.72	226	1.62	203	1.80	246	1.64	207	1.50	176	1.56	189	2.18	369	1.82	252
12,	2.55	514	1.84	258	1.70	221	2.02	313	1.70	221	1.78	241	1.78	241	1.55	187	1.54	185	1.52	180	2.18	369	1.78	241
13,	2.39	447	1.78	241	1.68	216	1.98	300	1.69	218	1.80	246	1.70	221	1.60	198	1.53	183	1.55	187	2.12	348	1.72	226
14,	2.34	427	1.78	241	1.94	288	1.95	291	1.66	212	1.66	212	1.70	221	1.60	198	1.51	178	1.56	189	2.07	330	1.71	223
15,	2.24	390	1.80	246	1.90	276	1.95	291	1.66	212	1.68	216	1.62	203	1.60	198	1.51	178	1.51	178	2.02	313	1.70	221
16,	2.30	411	1.80	246	1.94	288	1.95	291	1.70	221	1.70	221	1.65	209	1.52	180	1.50	176	1.50	176	1.86	264	1.68	216
17,	2.30	411	1.80	246	1.88	270	2.00	306	1.70	221	1.66	212	1.70	221	1.58	194	1.50	176	1.51	178	1.84	258	1.65	209
18,	2.35	431	1.75	233	1.81	249	1.84	258	1.70	221	1.64	207	1.65	209	1.58	194	1.58	194	1.51	178	1.84	258	1.70	221
19,	2.39	447	1.76	236	1.80	246	1.90	276	1.66	212	1.62	203	1.62	203	1.60	198	1.61	200	1.50	176	1.75	233	1.71	223
20,	2.34	427	1.73	228	1.87	267	1.84	258	1.65	209	1.64	207	1.58	194	1.60	198	1.51	178	1.81	249	1.76	236	1.64	207
21,	2.28	404	1.70	221	1.85	261	1.84	258	1.65	209	1.66	212	1.60	198	1.60	198	1.62	203	1.64	207	1.74	231	1.64	207
22,	2.20	376	1.76	236	1.84	258	1.84	258	1.66	212	1.65	209	1.61	200	1.60	198	1.61	200	1.58	194	1.70	221	1.73	228
23,	2.32	419	1.78	241	1.82	252	1.82	252	1.74	231	1.62	203	2.05	323	1.60	198	1.58	194	1.60	198	1.70	221	1.66	212
24,	2.32	419	1.70	221	1.80	246	1.80	246	1.76	236	1.61	200	2.78	621	1.56	189	1.52	180	1.76	236	1.85	261	1.82	252
25,	2.28	404	1.62	203	1.95	291	1.80	246	1.68	216	1.85	261	2.05	323	1.58	194	1.50	176	1.88	270	1.88	270	1.72	226
26,	2.22	383	1.65	209	2.50	491	1.76	236	1.72	226	1.70	221	1.90	276	1.58	194	1.52	180	2.15	358	1.80	246	1.78	241
27,	2.29	408	1.76	236	3.72	1310	1.95	291	1.88	270	1.68	216	1.82	252	1.58	194	1.48	172	1.75	233	1.78	241	1.74	231
28,	2.16	362	2.25	394	3.38	1000	2.35	431	2.62	545	1.68	216	1.78	241	1.58	194	1.51	178	1.56	189	1.74	231	1.74	231
29,	2.10	341	....	......	2.98	734	2.30	411	2.41	455	1.64	207	1.72	226	1.55	187	1.50	176	1.62	203	1.71	223	1.72	226
30,	2.10	341	....	......	2.75	606	2.28	404	2.28	404	1.65	209	1.70	221	1.54	185	1.56	189	1.61	200	1.68	216	1.68	216
31,	2.10	341	....	......	2.58	527	....	......	2.18	369	....	......	1.82	252	1.52	180	....	......	1.60	198	....	......	1.68	216

Note.—Six sec.-ft. added to daily discharge for canal.

ESTIMATED MONTHLY DISCHARGE OF SPRING CREEK, NEAR BELLEFONTE, CENTRE COUNTY, PA.

(Drainage area 145 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	514	189	384	2.648	3.053
February,	394	203	259	1.786	1.860
March,	1310	198	347	2.393	2.759
April,	491	236	322	2.221	2.478
May,	545	209	268	1.848	2.131
June,	334	200	232	1.600	1.785
July,	621	194	244	1.683	1.940
August,	221	180	200	1.379	1.590
September,	203	172	184	1.269	1.416
October,	358	176	199	1.372	1.581
November,	459	194	263	1.814	2.024
December,	279	207	231	1.593	1.837
The year,	1310	172	261	1.800	2.454

SUSQUEHANNA BASIN—STATION NO. 19.

BALD EAGLE CREEK AT BEECH CREEK STATION, PA.

DESCRIPTION OF STATION.

LOCATION—On three span, steel, highway bridge, at Beech Creek Station, Clinton county.

RECORDS AVAILABLE—Discharge complete from June 23, 1910, to December 31, 1913.

DRAINAGE AREA—565 square miles.

GAGE—A chain gage is fastened to the handrail on the upstream side of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 35.38 feet. Bench Mark No. 1 is outer downstream corner of right bridge seat, elevation 19.085 feet above gage datum. The gage is read twice daily by S. C. Mains.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is end of wooden guard-rail, downstream side, east end.

CHANNEL—The channel above the station of Bald Eagle creek is straight for 450 feet, but Beech creek comes in at right angles from the west immediately above the bridge. The channel below the station is straight for 600 feet. The right bank is 35 feet above the bed of the creek. The left bank is flat, being 8 to 10 feet above the bed of the creek. The bed is composed of rock and gravel.

DISCHARGE MEASUREMENTS OF BALD EAGLE CREEK, AT BEECH CREEK, CLINTON COUNTY, PA.

(Drainage area 565 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
7	Sept. 10	Hosmer, ...	159	392	0.45	1.56	176	0.6 measurement.
8	Nov. 11	Boehringer, ...	208	808	2.48	3.80	2007	Surface measurement.
9	Dec. 5	Reckord & Shade, ...	174	473	0.98	2.12	464	0.6 measurement.

DISCHARGE TABLE FOR BALD EAGLE CREEK, AT BEECH CREEK, CLINTON COUNTY, FROM JUNE 23, 1910.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.30	109	60	835	.80	1990	.90	3630	.10	5895
.40	147	.70	910	.90	2120	5.00	3800	.20	6110
.50	189	.80	990	4.00	2250	.10	3970	.30	6330
.60	235	.90	1070	.10	2380	.20	4140	.40	6550
.70	285	3.00	1160	.20	2520	.30	4320	.50	6775
.80	335	.10	1250	.30	2670	.40	4500	.60	7000
.90	385	.20	1345	.40	2825	.50	4685	.70	7225
2.00	440	.30	1440	.50	2980	.60	4875	.80	7450
.10	500	.40	1540	.60	3140	.70	5065	.90	7675
.20	560	.50	1645	.70	3300	.80	5265	7.00	7900
.30	625	.60	1755	.80	3465	.90	5470		
.40	690	.70	1870			6.00	5680		
.50	760								

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BALD EAGLE CREEK AT BEECH CREEK, CLINTON COUNTY, PA.

1910.	JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	......	......	1.83	350	1.52	198	1.91	390	2.49	753	2.43	711	2.58	820
2,	......	......	1.80	335	1.52	198	1.94	407	2.36	664	2.43	711	2.50	760
3,	......	......	1.77	320	1.50	189	2.19	554	2.33	644	2.41	697	2.45	725
4,	......	......	1.79	330	1.48	181	2.53	782	2.34	651	2.40	690	2.36	664
5,	......	......	1.75	310	1.46	172	2.51	768	2.27	606	2.36	664	2.34	651
6,	......	......	1.70	285	1.47	176	2.37	670	2.26	599	2.37	670	2.32	638
7,	......	......	1.69	280	1.47	176	2.19	554	2.25	592	2.09	494	2.28	612
8,	......	......	1.79	330	1.48	181	2.19	554	2.18	548	2.12	512	2.34	651
9,	......	......	1.75	310	1.52	198	2.29	618	2.14	524	2.09	494	2.30	625
10,	......	......	1.66	265	1.68	275	2.17	542	2.12	512	2.11	506	2.14	524
11,	......	......	1.63	250	1.68	275	2.13	518	2.10	500	2.13	518	2.22	573
12,	......	......	1.63	250	1.67	270	2.09	494	2.06	476	2.09	494	2.23	580
13,	......	......	2.67	888	1.56	217	2.11	506	2.19	554	2.12	512	2.20	560
14,	......	......	1.83	350	1.57	221	2.13	518	2.10	500	2.15	530	2.18	548
15,	......	......	1.69	280	1.64	255	2.05	470	2.17	542	2.17	542	2.26	599
16,	......	......	1.69	280	1.77	320	2.03	458	2.18	548	2.13	518	2.15	530
17,	......	......	2.15	530	1.87	370	1.97	424	2.19	554	2.13	518	1.92	396
18,	......	......	2.05	470	1.91	390	1.94	407	2.24	586	2.17	542	1.94	407
19,	......	......	1.75	310	1.96	418	1.89	380	2.14	524	2.10	500	2.05	470
20,	......	......	1.68	275	1.94	407	1.91	390	2.19	554	2.04	464	2.10	500
21,	......	......	1.64	255	1.91	390	1.91	390	2.19	554	1.98	429	2.06	476
22,	......	......	1.62	245	1.88	375	1.89	380	2.48	746	2.13	518	2.05	470
23,	......	......	1.59	230	1.88	375	1.91	390	2.66	880	2.07	482	2.10	500
24,	2.07	482	1.62	245	1.86	365	1.97	424	2.46	732	2.04	464	2.08	488
25,	1.99	434	1.61	240	1.82	345	2.12	512	2.38	677	2.13	518	1.90	385
26,	1.96	418	1.59	230	1.80	335	2.47	739	2.48	746	2.23	580	1.90	385
27,	1.94	407	1.59	230	1.78	325	2.60	835	2.46	732	2.19	554	2.20	560
28,	2.00	440	1.89	380	1.78	325	2.85	1030	2.50	760	2.27	606	2.16	536
29,	1.95	412	1.68	275	1.80	335	2.75	950	2.50	760	2.67	888	2.17	542
30,	1.86	365	1.61	240	1.85	360	2.61	842	2.50	760	2.67	888	2.46	732
31,	......	......	1.55	212	1.89	380	....	......	2.54	790	....	......	3.11	1260

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BALD EAGLE CREEK AT BEECH CREEK, CLINTON COUNTY, PA

1911.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.17	1320	2.79	982	2.68	895	2.96	1120	2.70	910	1.92	396	1.70	285	1.60	235	3.20	1340	3.30	1440	2.79	982	2.63	858
2,	3.26	1400	2.69	902	2.66	880	2.82	1010	2.75	950	1.86	365	1.68	275	1.55	212	2.85	1030	f10.16	b15600	2.72	926	2.62	850
3,	3.38	1520	2.52	775	2.58	820	2.72	926	2.52	775	1.82	345	1.65	260	2.14	524	2.78	974	5.54	4760	2.65	872	2.62	850
4,	3.28	1420	2.56	805	2.51	768	2.68	895	2.46	732	1.85	360	1.64	255	2.40	690	2.65	872	4.40	2820	2.61	842	2.58	820
5,	3.42	1560	2.50	760	2.36	664	3.03	1190	2.36	664	2.08	488	1.62	245	2.63	858	2.58	820	3.78	1970	2.60	835	2.54	790
6,	3.71	1880	2.38	677	2.60	835	3.50	1640	2.31	632	2.12	512	1.60	235	2.04	464	3.44	1580	3.48	1620	2.66	880	2.49	753
7,	3.25	1390	2.44	718	2.26	599	3.36	1500	2.26	599	1.92	396	1.60	235	1.90	385	3.08	1230	5.14	4040	3.28	1420	2.48	746
8,	3.16	1310	2.46	732	2.26	599	3.30	1440	2.21	566	1.88	375	1.60	235	1.80	335	3.38	1520	4.28	2640	2.94	1110	2.48	746
9,	2.92	1100	2.36	664	2.19	554	3.32	1460	2.22	573	1.81	340	1.62	245	1.77	320	e7.10	8120	3.80	1990	2.84	1020	2.61	842
10,	2.80	990	2.32	638	2.49	753	3.30	1440	2.18	548	1.81	340	1.64	255	1.72	295	4.91	3650	3.55	1700	2.79	982	2.67	888
11,	2.74	942	2.12	512	2.75	950	3.12	1270	2.26	599	1.81	340	1.66	265	1.68	275	3.78	1970	3.48	1620	2.79	982	2.64	865
12,	2.98	1140	2.09	494	2.68	895	3.02	1180	2.16	536	2.88	1050	1.62	245	1.68	275	3.30	1440	3.26	1400	2.82	1010	2.64	865
13,	3.78	1970	2.24	586	2.68	895	2.92	1090	2.09	494	3.20	1340	1.59	230	1.65	260	3.04	1200	3.12	1270	3.02	1180	2.72	926
14,	5.38	4460	2.54	790	2.64	865	3.12	1270	2.06	476	2.56	805	1.60	235	1.64	255	2.89	1060	2.98	1140	2.79	982	2.68	895
15,	a6.74	7320	3.18	1330	2.69	902	3.72	1890	2.04	464	2.38	677	1.60	235	1.64	255	4.95	3720	2.94	1110	2.82	1010	3.31	1450
16,	4.72	3330	2.70	910	2.52	775	3.54	1690	2.04	464	2.24	586	1.64	255	2.35	658	4.92	3600	2.92	1090	2.80	990	4.52	3010
17,	4.36	2760	2.58	820	2.55	798	3.36	1500	2.06	476	2.14	524	1.72	295	2.05	470	3.90	2120	2.80	998	2.90	1070	4.40	2820
18,	3.37	1510	3.62	1780	2.50	760	3.16	1310	2.06	476	2.09	494	1.65	260	2.44	718	3.54	1690	3.46	1600	2.90	1070	3.98	2220
19,	3.12	1270	3.60	1760	2.42	704	3.02	1180	2.04	464	2.03	458	1.59	230	2.23	580	3.30	1440	3.14	1290	2.85	1030	3.62	1780
20,	2.94	1110	3.30	1440	2.49	753	c4.72	3330	2.32	638	1.96	418	1.60	235	2.12	512	3.13	1280	3.03	1190	2.91	1080	3.36	1500
21,	2.85	1030	3.00	1160	2.58	820	4.35	2750	2.14	524	1.90	385	1.70	285	2.03	458	2.97	1130	2.98	1140	2.91	1080	3.22	1360
22,	2.72	926	2.85	1030	2.50	760	4.32	2700	2.06	476	1.86	365	1.72	295	1.96	418	3.02	1180	3.32	1460	2.89	1060	3.16	1310
23,	2.59	828	2.72	926	2.49	750	4.15	2450	2.06	476	1.86	365	1.65	260	1.92	396	2.93	1100	3.50	1640	2.79	982	3.33	1470
24,	2.45	725	2.59	828	2.48	746	3.82	2020	2.07	482	1.85	360	1.69	280	2.12	512	2.72	926	3.22	1360	2.90	1070	3.14	1290
25,	2.41	697	2.63	858	2.43	711	3.55	1700	2.00	440	1.88	375	1.74	305	3.00	1160	2.64	865	3.14	1290	2.87	1050	3.06	1210
26,	2.45	725	2.68	895	2.40	690	3.35	1490	1.96	418	1.90	385	1.66	265	2.86	1010	2.78	974	3.09	1240	2.83	1010	3.08	1230
27,	2.46	732	2.78	974	3.52	1670	3.14	1290	1.92	396	2.00	440	1.64	255	2.51	768	2.68	895	3.02	1180	2.76	958	3.58	1730
28,	3.88	2090	2.72	926	b4.04	2300	2.94	1110	1.88	375	1.84	355	1.62	245	2.54	790	2.70	910	2.99	1150	2.76	958	3.45	1590
29,	3.20	1340	......	....	3.62	1780	2.84	1020	1.88	375	1.74	305	1.62	245	d4.10	2380	3.18	1330	2.92	1090	2.73	934	3.30	1440
30,	3.24	1380	......	....	3.50	1640	2.76	958	2.00	440	1.74	305	1.64	255	3.55	1700	3.56	1710	2.82	1010	2.59	828	3.22	1360
31,	2.80	990	......	....	3.25	1390	......	....	1.90	385	......	......	1.62	245	3.48	1620	......	....	2.82	1010	....	......	3.14	1290

Notes.—aMax. 7.20′ at 7.45 a. m.; 8350 sec. ft. bMax. 4.2′ at 7 a. m.; 2520 sec. ft. cMax. 4.9′ at 5 p. m.; 3630 sec. ft. dMax. 4.65′ at 5 p. m.; 3220 sec. ft. eMax. 8.5′ at 5 p. m.; 11500 sec. ft. fMax. 10.9′ at a. m.; 17400 sec. ft. hEstimated.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BALD EAGLE CREEK AT BEECH CREEK, CLINTON COUNTY, PA.

1912.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.04	1200	......	500	......	500	4.97	3750	4.62	3170	2.23	580	1.71	290	1.68	275	2.12	512	2.65	872	2.81	998	†2.58	820
2,	2.88	1050	......	560	......	500	5.26	4250	4.06	2330	2.16	536	1.71	290	1.66	265	2.34	651	2.55	798	2.84	1020	2.59	828
3,	2.80	990	......	500	......	500	b5.40	4500	3.65	1810	2.17	542	1.71	290	1.65	260	2.73	934	2.45	725	†2.78	974	2.56	805
4,	2.74	942	......	500	......	500	4.54	3040	3.29	1430	2.11	506	1.71	290	1.64	255	2.58	820	2.43	711	2.72	926	2.56	805
5,	2.55	798	......	560	......	500	4.05	2320	3.14	1290	2.05	470	1.73	300	1.64	255	2.36	664	2.35	658	2.71	918	2.57	812
6,	*	700	......	500	......	500	3.72	1890	3.16	1310	2.08	488	1.72	295	1.63	250	2.17	542	2.25	592	2.70	910	g3.23	1370
7,	......	700	......	500	......	500	3.69	1860	3.70	1870	2.05	470	1.71	290	1.62	245	2.13	518	2.29	618	f4.18	2490	3.14	1290
8,	......	700	......	500	......	500	3.60	1760	3.58	1730	2.03	458	1.67	270	1.62	245	2.09	494	2.33	644	4.27	2620	†3.05	1200
9,	......	700	......	560	......	500	3.33	1470	3.66	1820	1.98	429	1.71	290	1.62	245	2.04	464	2.31	632	3.63	1790	2.96	1120
10,	......	700	......	500	......	500	3.21	1350	3.41	1550	1.93	402	1.76	315	1.80	335	1.99	434	2.45	725	†3.45	1590	2.98	1140
11,	......	700	......	500	......	500	3.14	1290	3.34	1480	1.94	407	1.81	340	1.79	330	2.04	464	2.65	872	3.27	1410	2.82	1010
12,	......	700	......	500	......	500	3.06	1210	3.48	1620	1.94	407	1.74	305	1.82	345	2.06	476	2.57	812	3.07	1220	2.78	974
13,	......	700	......	500	......	500	3.18	1330	3.68	1850	1.95	412	1.73	300	1.76	315	2.04	464	†2.59	828	3.01	1170	2.91	1080
14,	......	700	......	500	......	560	3.05	1200	3.40	1540	1.93	402	1.72	295	1.92	396	2.00	440	2.61	842	3.01	1170	3.10	1250
15,	......	700	......	500	a5.85	5370	3.14	1290	3.24	1380	1.91	390	1.85	360	1.85	360	2.10	500	2.58	820	2.83	1010	†2.94	1110
16,	......	600	......	500	5.98	5640	3.30	1440	c4.42	2860	2.44	718	1.73	300	1.88	375	2.44	718	2.57	812	2.79	982	2.78	974
17,	......	600	......	500	4.75	5380	3.28	1420	5.35	4410	2.23	580	1.79	330	1.90	385	2.26	599	2.57	812	†2.75	950	3.01	1170
18,	......	600	......	500	5.08	3940	4.84	3530	4.46	2920	2.03	458	1.79	330	2.02	452	2.09	494	2.55	798	2.71	918	2.54	790
19,	......	600	......	500	5.18	4110	4.05	2320	3.92	2150	1.93	402	1.75	310	2.09	494	2.04	464	2.65	872	2.66	880	2.54	790
20,	......	600	......	500	5.56	4800	3.58	1730	3.51	1660	1.87	370	1.71	290	2.26	599	2.06	476	2.72	926	2.64	865	2.50	760
21,	......	600	......	500	5.05	3880	3.35	1490	3.28	1420	1.85	360	1.73	300	2.33	644	2.04	464	2.63	858	2.60	835	2.42	704
22,	......	600	......	900	4.32	2700	3.16	1310	3.06	1210	1.93	402	2.01	446	2.28	612	2.04	464	2.61	842	2.57	812	2.36	664
23,	......	600	......	900	3.80	1990	3.11	1260	2.91	1080	1.83	350	1.81	340	2.24	586	2.13	518	e3.01	1170	2.55	798	2.31	632
24,	......	600	......	900	3.82	2020	2.92	1090	2.76	958	1.85	360	1.75	310	2.14	524	d3.88	2090	3.14	1290	†2.56	805	2.36	664
25,	......	600	......	900	4.12	2410	2.86	1040	2.66	880	1.84	355	1.73	300	2.12	512	4.18	2490	3.13	1280	2.57	812	2.26	599
26,	......	550	......	900	3.98	2220	2.76	958	2.57	812	1.84	355	1.73	300	2.04	464	3.32	1460	3.15	1300	2.51	768	2.18	548
27,	......	550	......	900	4.22	2550	2.84	1020	2.47	739	1.81	340	1.73	300	2.10	500	2.94	1110	3.06	1210	2.56	805	2.32	638
28,	......	550	......	900	4.88	3600	2.72	926	2.40	690	1.78	325	1.67	270	2.08	488	2.74	942	2.96	1120	2.59	828	2.24	586
29,	......	550	......	900	5.98	5640	3.50	1640	2.42	704	1.79	330	1.61	240	2.20	560	2.98	1140	2.95	1120	2.57	812	†2.38	677
30,	......	550	......	....	6.18	6070	4.97	3750	2.43	711	1.75	310	1.65	260	2.12	512	2.82	1010	2.91	1080	2.57	812	2.51	768
31,	......	550	......	....	5.20	4140	......	....	2.31	632	......	......	1.66	265	2.09	494	......	....	2.85	1030	......	....	3.03	1190

*Creek frozen Jan. 1-Mar. 14 inc. †Interpolated. aMax. 7.10′ at 5 p. m.; 8120 sec. ft. bMax. 5.70′ at 7.30 a. m.; 5060 sec. ft. cMax. 5.70′ at 5 p. m.; 5060 sec. ft. dMax. 4.48′ at 5.00 p. m.; 2950 sec. ft. eMax. 3.29′ at 5.00 p. m.; 1432 sec. ft. fMax. 5.07′ at 5.00 p. m.; 3920 sec. ft. gMax. 3.41′ at 5.00 p. m.; 1550 sec. ft. Discharge estimated from climatological records.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BALD EAGLE CREEK AT BEECH CREEK, CLINTON COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dic.	G H	Dis.	G H	Dis.	G H	Dis	G H	Dis.	G H	Dis.	G H	Dis.
1,	2.77	966	2.90	1070	2.65	872	3.68	1850	3.49	1630	†3.30	1440	1.86	365	2.19	554	1.56	217	1.66	265	2.14	524	2.21	566
2,	2.64	865	2.63	858	†2.49	753	3.22	1360	3.32	1460	2.96	1120	1.86	365	2.09	494	1.60	235	1.90	385	†2.08	488	2.22	573
3,	4.31	2690	2.37	670	2.33	644	3.16	1310	3.00	1160	2.78	974	1.81	340	†2.04	464	1.55	212	1.82	345	2.02	452	2.20	560
4,	3.96	2200	2.68	895	2.27	606	3.02	1180	†2.82	1010	2.68	895	1.81	340	1.99	434	1.54	207	1.73	300	1.99	434	2.18	548
5,	3.62	1780	2.47	739	2.41	697	2.92	1090	2.65	872	2.48	746	1.94	407	1.92	396	1.55	212	1.66	265	1.95	412	2.16	536
6,	3.27	1410	2.55	798	2.35	658	†2.80	990	2.54	790	2.36	664	†2.01	446	1.91	390	1.56	217	1.59	230	1.93	402	2.13	518
7,	3.82	2020	2.77	966	2.20	560	2.69	902	2.45	725	2.36	664	2.09	494	1.89	380	†1.63	250	1.61	240	1.89	380	*3.00	1160
8,	5.86	5390	2.89	1060	2.34	651	2.63	858	2.32	638	†2.28	612	1.97	424	1.87	370	1.70	285	1.59	230	1.88	375	†2.92	1090
9,	4.91	3650	†3.01	1170	†2.34	651	2.56	805	2.26	599	2.19	554	1.95	412	1.87	370	1.65	260	1.59	230	5.68	5030	2.84	1020
10,	4.14	2440	3.13	1280	2.33	644	2.52	775	2.17	542	2.14	524	5.16	4070	†1.87	370	1.58	226	1.59	230	5.48	4650	2.72	926
11,	4.21	2540	2.95	1120	2.52	775	2.65	872	†2.15	530	2.10	500	2.90	1070	1.87	370	1.57	221	1.62	245	3.74	1920	2.62	850
12,	4.60	3140	2.77	966	2.50	760	2.88	1050	2.13	518	2.04	464	3.29	1430	1.85	360	1.55	212	†1.67	270	3.22	1360	2.53	782
13,	4.21	2540	3.10	1250	2.42	704	†2.80	990	2.12	512	2.02	452	3.13	1280	1.78	325	1.54	207	1.73	300	3.00	1160	2.49	753
14,	3.86	2070	3.21	1350	3.56	1710	2.72	926	2.12	512	1.98	429	2.97	1130	1.75	310	†1.52	198	1.64	255	3.11	1260	†2.42	704
15,	3.51	1660	3.15	1300	3.56	1710	2.77	966	2.16	536	†1.98	429	2.73	934	1.73	300	1.51	194	1.64	255	†3.02	1180	2.35	658
16,	3.36	1500	†2.71	918	†3.38	1520	2.71	918	2.20	560	1.98	429	2.49	753	1.71	290	1.53	203	1.60	235	†2.93	1100	2.27	606
17,	3.88	2090	2.27	606	3.19	1340	2.62	850	2.16	536	1.90	385	2.38	677	1.66	265	1.52	198	1.59	230	2.85	1030	2.24	586
18,	3.77	1950	2.11	506	2.98	1140	2.52	775	†2.08	488	1.87	370	2.28	612	1.65	260	1.64	255	1.60	235	2.76	958	2.19	554
19,	3.70	1870	2.14	524	2.91	1080	2.49	753	2.01	446	1.86	365	2.15	530	1.61	240	1.58	226	†2.22	573	2.66	880	2.12	512
20,	3.64	1800	2.14	524	2.92	1090	†2.46	732	1.97	424	1.98	429	†2.08	488	1.63	250	1.60	235	2.84	1020	2.58	820	2.05	470
21,	3.62	1780	2.16	536	2.97	1130	2.42	704	1.99	434	2.13	518	2.01	446	1.65	260	†1.71	290	*2.99	1150	2.52	775	*1.98	429
22,	3.31	1450	2.24	586	2.92	1090	2.38	677	2.07	482	†2.04	464	1.91	390	1.63	250	1.92	396	2.08	488	2.44	718	*1.91	390
23,	3.42	1560	†2.15	530	†2.98	1140	2.37	670	2.30	625	1.94	407	1.91	390	1.73	300	1.62	245	1.91	390	†2.37	670	2.22	573
24,	3.92	2150	2.07	482	3.05	1200	2.35	658	3.02	1180	1.89	380	c4.73	3350	†1.69	280	1.64	255	1.91	390	2.30	625	2.68	895
25,	3.68	1850	1.99	434	3.32	1460	2.34	651	†2.86	1040	1.88	375	3.55	1700	1.65	260	1.60	235	3.08	1230	2.25	592	2.55	798
26,	3.53	1680	2.27	606	5.23	4190	2.30	625	2.69	902	2.16	536	3.63	1790	1.61	240	1.63	250	4.42	2860	2.20	560	2.64	865
27,	3.38	1520	2.11	506	a8.64	*11800	*4.00	2250	3.63	1790	2.12	512	†3.17	1320	1.61	240	1.58	226	3.24	1380	2.18	548	2.48	746
28,	3.19	1340	2.99	1150	6.34	6420	4.42	2860	b6.46	6680	2.05	470	2.72	926	1.61	240	1.56	217	2.81	998	2.16	536	†2.56	805
29,	3.04	1200	......	....	4.75	3380	4.38	2790	5.50	4680	†1.96	418	2.49	753	1.62	245	1.54	207	2.57	812	2.22	573	2.65	872
30,	2.97	1130	......	....	†4.30	2670	3.89	2110	4.22	2550	1.86	365	2.37	670	1.55	212	1.60	235	2.36	664	†2.22	573	2.24	586
31,	2.96	1120	......	....	3.84	2040	......	....	3.64	1800	......	.....	2.28	612	†1.55	212	......	....	2.25	592	......	....	2.21	566

†Interpolated. aMax. 9.15′ at 5 p. m.; 13000 sec. ft. bMax. 7.22′ at 5 p. m.; 8400 sec. ft. cMax. 5.30′ at 5 p. m.; 4320 sec. ft. *Estimated.

ESTIMATED MONTHLY DISCHARGE OF BALD EAGLE CREEK, AT BEECH CREEK, CLINTON COUNTY, PA.

(Drainage area 565 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1910.					
July,	888	212	315	0.558	0.644
August,	418	172	290	0.513	0.592
September,	1030	380	563	0.996	1.112
October,	880	476	631	1.117	1.288
November,	888	429	574	1.016	1.134
December,	1260	385	586	1.037	1.195
1911.					
January,	8350	697	1650	2.920	3.366
February,	1780	494	917	1.623	1.690
March,	2520	554	933	1.651	1.903
April,	3630	895	1527	2.703	3.016
May,	950	375	543	0.961	1.108
June,	1340	305	475	0.841	0.938
July,	305	230	256	0.453	0.522
August,	3220	212	639	1.131	1.304
September,	11500	820	1723	3.050	3.403
October,	17400	998	2092	3.703	4.269
November,	1420	828	1007	1.782	1.988
December,	3010	746	1282	2.269	2.616
The year,	17400	212	1087	1.924	26.123
[a]1912.					
January,	....	....	686	1.214	1.400
February,	....	....	610	1.080	1.165
March,	8120	....	2310	4.088	4.713
April,	5060	926	1910	3.381	3.772
May,	5060	632	1610	2.850	3.286
June,	718	310	430	0.761	0.849
July,	446	240	304	0.538	0.621
August,	644	245	406	0.719	0.829
September,	2950	434	761	1.347	1.503
October,	1430	592	893	1.581	1.823
November,	3920	768	1100	1.947	2.172
December,	1550	548	896	1.586	1.829
The year,	....	....	993	1.758	23.962
1913.					
January,	5390	865	1980	3.505	4.041
February,	1350	434	836	1.480	1.541
March,	13000	560	1780	3.150	3.632
April,	2860	625	1130	2.000	2.231
May,	8400	424	1180	2.089	2.409
June,	1440	365	563	0.997	1.113
July,	4320	340	933	1.651	1.903
August,	554	212	320	0.566	0.653
September,	396	194	234	0.414	0.462
October,	2860	230	558	0.988	1.139
November,	5030	375	1030	1.823	2.034
December,	1160	390	693	1.227	1.415
The year,	13000	194	930	1.658	22.573

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[a] Creek frozen Jan. 1-Mar. 14 inclusive, and discharge estimated from climatological records.

PINE CREEK.

DESCRIPTION OF BASIN.

Pine creek, one of the major tributaries of the West Branch of the Susquehanna river, drains an area of approximately 975 square miles in Potter, Tioga and Lycoming counties. Rising in the northeastern part of Potter county on the divide of the Allegheny, Genesee and Susquehanna river basins, it flows in a general southeasterly direction to its mouth at Jersey Shore, Lycoming county, a distance of approximately 75 miles.

The headwaters are steep and rapid, flowing through narrow valleys to Galeton, Potter county, from which point the creek continues in a broader valley and with less fall, passing through extensive marshy areas into Tioga county, where it turns southward through a deep, narrow valley, with considerable fall, walled in on either side by high table land, through which it has cut a channel with steep, precipitous sides, nearly to its mouth, where the valley again broadens out. This stream has many tributaries, the most important being West Branch, Marsh run, Babb creek and Little Pine creek. Practically the entire watershed is well covered with second growth timber, there being proportionately little cultivated land. The headwaters of Pine creek lie within the glacial area. There are numerous small villages in its basin, and a few boroughs of considerable size, some of which obtain their water supply therefrom.

The upper part of the watershed is subject to a mean annual precipitation of 35 to 40 inches, while the lower part lies in an area of from 40 to 45 inches.

The discharge has been measured since July 15, 1908, at Waterville, 13½ miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 20.

PINE CREEK AT WATERVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, about three-fourths of a mile above the N. Y. C. Railroad Station at Waterville, Lycoming county.

RECORDS AVAILABLE—Discharge complete from July 15th, 1908, to December 31st, 1913.

DRAINAGE AREA—750 square miles.

GAGE—A standard chain gage is fastened to the downstream handrail. The elevation of zero is arbitrary. The length of chain from bottom of weight to the marker is 29.67 feet. Bench Mark No. 1 is a projection on stone 2.7 feet in from face of right abutment, downstream side or wing, lowest stone, dog mark on stone just at point, elevation 7.088 feet above gage datum. The gage is read twice daily by Howard Harris.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, the initial point for soundings being the right end of the downstream handrail. Wading measurements are obtained during low stages at a point several hundred feet above the bridge.

CHANNEL—The channel above the station is straight for 2,000 feet with a riffle 1,000 feet above. The channel below the station is straight for 500 feet, with a riffle 300 feet below. The right bank is not subject to overflow, except during extreme high stages such as the floods of 1865 and 1889, while the left bank is high and not subject to overflow. The bed is composed of gravel.

DISCHARGE MEASUREMENTS OF PINE CREEK, AT WATERVILLE, LYCOMING COUNTY, PA.

(Drainage area 750 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean Velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
31	Sept. 11	Hosmer, ...	80	66	0.70	0.75	46	Wading 800′ above bridge.
32	Dec. 2	Reckord & Shade, ...	219	352	1.65	1.78	582	9.6 measurement.

DISCHARGE TABLE FOR PINE CREEK, AT WATERVILLE, LYCOMING COUNTY, FROM JULY 16, 1908.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
0.60	25	3.00	1835	.40	6160	.80	12700	.20	20750
.70	40	.10	1960	.50	6410	.90	13000	.30	21120
.80	60	.20	2090	.60	6660	8.00	13300	.40	21490
.90	95	.30	2220	.70	6910	.10	13600	.50	21870
1.00	130	.40	2355	.80	7165	.20	13900	.60	22260
.10	175	.50	2500	.90	7420	.30	14200	.70	22650
.20	225	.60	2645	6.00	7675	.40	14510	.80	23045
.30	280	.70	2790	.10	7930	.50	14830	.90	23445
.40	335	.80	2935	.20	8185	.60	15160	11.00	23850
.50	400	.90	3090	.30	8440	.70	15490	.10	24250
.60	465	4.00	3250	.40	8700	.80	15820	.20	24650
.70	535	.10	3410	.50	8965	.90	16150	.30	25050
.80	610	.20	3575	.60	9230	9.00	16490	.40	25450
.90	695	.30	3750	.70	9500	.10	16830	.50	25850
2.00	780	.40	3940	.80	9775	.20	17170	.60	26260
.10	870	.50	4130	.90	10050	.30	17515	.70	26670
.20	965	.60	4320	7.00	10325	.40	17860	.80	27080
.30	1065	.70	4520	.10	10610	.50	18210	.90	27490
.40	1165	.80	4740	.20	10905	.60	18570	12.00	27900
.50	1265	.90	4970	.30	11200	.70	18930	.10	28320
.60	1370	5.00	5200	.40	11500	.80	19290	.20	28740
.70	1480	.10	5430	.50	11800	.90	19650	.30	29160
.80	1595	.20	5670	.60	12100	10.00	20010	.40	29580
.90	1715	.30	5910	.70	12400	.10	20380	.50	30000

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF PINE CREEK AT WATERVILLE, LYCOMING COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	1.97	754	2.44	1200	......	1500	3.55	2570	3.71	2800	2.76	1550	1.08	166	0.83	70	0.93	106	1.01	134	2.05	825	1.80	610
2, ...	1.87	670	2.24	1000	......	1500	3.20	2090	3.31	2230	2.61	1380	1.03	144	0.83	70	0.78	56	1.41	342	2.00	780	1.70	535
3, ...	2.27	1040	2.14	908	2.67	1450	2.90	1720	3.21	2100	2.41	1180	1.03	144	0.83	70	0.63	30	1.36	313	1.90	695	1.70	535
4, ...	4.72	4560	2.04	816	2.41	1180	2.60	1370	3.01	1850	2.26	1020	1.03	144	0.83	70	0.63	30	1.21	230	1.90	695	1.85	652
5, ...	3.77	2890	1.94	729	1.90	695	2.50	1260	2.81	1610	1.96	746	1.23	242	0.83	70	0.63	30	1.01	134	1.80	610	1.95	738
6, ...	3.12	1990	1.84	644	1.80	610	2.40	1160	2.66	1440	1.76	580	1.43	354	0.83	70	0.63	30	0.96	116	1.80	610	2.15	918
7, ...	3.82	2970	....	600	3.05	1900	2.30	1060	2.31	1080	1.66	507	1.18	215	0.83	70	0.63	30	0.91	98	1.65	500	2.25	1020
8, ...	a6.67	9420	....	600	3.00	1840	2.20	965	2.11	880	1.61	472	1.03	144	0.73	46	0.63	30	0.91	98	1.65	500	2.35	1120
9, ...	7.17	10800	....	600	2.00	780	2.10	870	1.96	746	1.61	472	1.03	144	0.73	46	0.63	30	0.96	116	2.35	1120	2.25	1020
10, ...	5.12	5480	....	600	1.90	695	2.10	870	1.76	580	1.51	406	1.03	144	0.73	46	0.63	30	1.01	134	5.50	6410	2.15	918
11, ...	4.32	3790	....	600	1.90	695	2.10	870	1.71	542	1.51	406	1.03	144	0.73	46	0.73	46	1.01	134	4.80	4740	2.10	870
12, ...	4.17	3520	....	600	1.95	738	2.10	870	1.71	542	1.51	406	1.03	144	0.73	46	0.72	44	1.16	205	4.15	3490	2.10	870
13, ...	4.02	3280	....	600	1.80	610	2.00	780	1.61	472	1.51	406	1.03	144	0.73	46	0.62	28	1.21	230	3.40	2360	2.00	780
14, ...	3.72	2820	....	600	4.00	3250	2.00	780	1.61	472	1.41	342	1.03	144	0.73	46	0.62	28	1.31	286	3.05	1900	1.90	695
15, ...	3.47	2460	....	600	3.70	2790	2.00	780	1.61	472	1.41	342	1.03	144	0.73	46	0.62	28	1.21	230	2.90	1720	1.90	695
16, ...	3.22	2120	....	600	3.40	2360	2.00	780	1.61	472	1.41	342	1.08	166	0.73	46	0.62	28	1.11	180	2.80	1600	1.90	695
17, ...	3.12	1990	....	600	3.00	1840	2.00	780	1.51	406	1.31	286	1.18	215	0.73	46	0.62	28	1.26	258	2.80	1600	1.80	610
18, ...	3.97	3200	....	600	2.70	1480	2.00	780	1.51	406	1.31	286	1.13	190	0.83	70	0.62	28	1.31	286	2.65	1420	1.80	610
19, ...	4.27	3700	....	600	2.60	1370	1.95	738	1.51	406	1.71	542	1.08	166	0.83	70	0.62	28	1.41	342	2.60	1370	1.70	535
20, ...	3.87	3040	....	600	2.85	1660	1.90	695	1.51	406	1.66	507	1.03	144	0.88	88	0.62	28	2.11	880	2.45	1220	1.60	465
21, ...	4.37	3880	....	500	2.55	1320	1.85	652	1.51	406	1.46	374	1.03	144	0.83	70	0.77	54	3.06	1910	2.40	1160	1.70	535
22, ...	3.82	2970	....	500	2.80	1600	1.80	610	1.51	406	1.36	313	1.63	144	0.78	56	1.22	236	2.51	1280	2.30	1060	1.70	535
23, ...	3.62	2670	....	500	2.80	1600	1.80	610	1.71	542	1.26	258	0.93	106	0.73	46	1.12	185	1.96	746	2.20	965	1.85	652
24, ...	3.97	3200	....	500	2.80	1600	1.75	572	2.51	1280	1.21	230	1.28	269	0.73	46	1.07	162	1.91	704	2.10	870	2.00	780
25, ...	3.72	2820	....	500	6.05	7800	1.70	535	2.46	1220	1.21	230	1.18	215	0.73	46	1.02	139	2.66	1440	2.00	780	2.00	780
26, ...	3.47	2460	....	500	8.35	14400	1.70	535	2.26	1020	1.21	230	1.13	190	0.73	46	0.92	102	5.31	5940	2.00	780	2.20	965
27;	3.27	2180	....	1200	b11.53	26000	1.80	610	2.41	1180	1.16	205	1.03	144	0.73	46	0.82	67	3.91	3110	2.00	780	2.10	870
28, ...	3.27	2180	....	1500	8.10	13600	5.40	6160	4.76	4650	1.11	180	0.93	106	0.73	46	0.82	67	3.51	2510	1.90	695	2.00	780
29, ...	2.87	1680	....	......	5.70	6910	c7.60	12100	4.06	3350	1.01	134	0.93	106	0.73	46	0.82	67	3.11	1970	1.90	695	2.80	1600
30, ...	2.62	1390	....	......	4.45	4040	5.30	5910	3.91	3110	1.06	157	0.93	106	0.73	46	0.82	67	2.71	1490	1.90	695	3.80	2940
31, ...	2.47	1240	....	......	3.85	3010	......	......	3.11	1970	....	......	0.93	106	0.93	106	....	......	2.16	927	......	......	4.75	4630

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a Max. 8.27′ at 4.25 P. M.=14100 Sec. ft. b Max. 12′ at night=27900 Sec. ft. c Max. 8.00′ at 8 A. M.=13300 Sec. ft. Creek frozen Feb. 7 to March 2 incl., discharge estimated from climatological record and discharge of West Branch Susquehanna River at Williamsport.

ESTIMATED MONTHLY DISCHARGE OF PINE CREEK, AT WATERVILLE, LYCOMING COUNTY, PA.

(Drainage area 750 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	14100	670	3130	4.173	4.811
February,	....	....	693	0.924	0.962
March,	27900	610	3570	4.760	5.488
April,	13300	535	1670	2.227	2.485
May,	4650	406	1260	1.680	1.937
June,	1550	134	483	0.644	0.718
July,	354	106	164	0.219	0.253
August,	106	46	57	0.076	0.088
September,	236	28	62	0.083	0.092
October,	5940	98	864	1.152	1.328
November,	6410	500	1420	1.893	2.112
December,	4630	465	966	1.288	1.485
The year,	....	....	1190	1.593	21.759

NOTE.—Creek frozen Feb. 7 to March 2, incl., and discharge estimated from climatological records and discharge of West Br. Susquehanna River at Williamsport.

LYCOMING CREEK.

DESCRIPTION OF BASIN.

Lycoming creek, a tributary of the West Branch of the Susquehanna river in the central part of Lycoming county, drains an approximate area of 275 square miles. Rising in the northeastern corner of Lycoming county, it flows in a general southerly direction through Tioga and Lycoming counties, a distance of 34 miles, to its mouth a short distance above Williamsport. The upper portion of this stream and its tributaries lie within the glacial area, in a sparsely inhabited region well covered with second growth timber, the valleys being generally narrow, the side hills high and steep and the fall rapid. Throughout the lower section the valley is wide and the stream has a flat slope through an agricultural region. There are numerous small tributaries, the largest being Roaring Branch. Only a few villages lie along this stream, the larger being near the mouth. This creek and its tributaries are used to some extent for power purposes by grist mills.

The mean annual precipitation over the greater portion of this watershed is from 40 to 45 inches.

The discharge of this creek has been measured from July 14, 1908, to December 31, 1912, at Bridge No. 2 of the Northern Central Railroad, three miles above the mouth, and since December 4, 1913, at Bridge No. 10, near Trout Run.

SUSQUEHANNA BASIN—STATION NO. 21.

LYCOMING CREEK NEAR TROUT RUN, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, 2½ miles above Trout Run, Lycoming county.

RECORDS AVAILABLE—Discharge measurement and gage heights from December 4 to 31, 1913.

DRAINAGE AREA—185 square miles.

GAGE—A standard chain gage is fastened to the downstream handrail. The elevation of zero is arbitrary. The length of chain from bottom of weight to marker is 23.12 feet. Bench Mark No. 1 is niche cut on top of stone of 11th course from top, right abutment, downstream side, 1.55 feet in from face of abutment, elevation 8.54 feet above gage datum. The gage is read twice daily by E. L. Apker.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is extreme right end pipe handrail, downstream side.

CHANNEL—The channel is straight above and below the station for 200 feet and 100 feet respectively. The right bank is of medium height and overflows during extreme high stages. The left bank is high and not subject to overflow. The bed is composed of gravel and sand, and is very uniform.

DISCHARGE MEASUREMENT OF LYCOMING CREEK, NEAR TROUT RUN, LYCOMING COUNTY, PA.

(Drainage area 185 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velicoty.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
1	1913 Dec. 3	Reckord & Shade, .	102	151	0.91	2.77	138	Surf. & 0.6 msmt.

DAILY MEAN GAGE HEIGHTS OF LYCOMING CREEK NEAR TROUT RUN, LYCOMING COUNTY, PA.

1913	DEC.	1913	DEC.
DAY.	Gage height.	DAY.	Gage height.
1,	....	16,	2.82
2,	....	17,	2.80
3,	....	18,	2.75
4,	2.70	19,	2.68
5,	2.70	20,	2.60
6,	2.70	21,	2.62
7,	2.70	22,	2.62
8,	3.10	23,	2.60
9,	3.85	24,	3.85
10,	3.65	25,	3.40
11,	3.45	26,	3.32
12,	3.25	27,	3.12
13,	3.05	28,	3.08
14,	2.90	29,	3.15
15,	2.90	30,	3.15
		31,	3.00

SUSQUEHANNA BASIN—STATION NO. 22.

WEST BRANCH SUSQUEHANNA RIVER AT WILLIAMSPORT.

DESCRIPTION OF STATION.

LOCATION—On five span, steel, through-truss highway bridge, at Market Street, Williamsport, Lycoming county.

RECORDS AVAILABLE—Discharge complete from March 1, 1895, to December 31, 1913.

DRAINAGE AREA—5,670 square miles.

GAGE—A standard chain gage is fastened to the upstream side of the bridge. The elevation of zero is 496.4 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 40.23 feet. Bench Mark No. 1 is cut in face of left abutment of bridge, 16th course down from bridge seat, elevation 10.00 feet above gage datum. The gage is read twice daily by John R. Mundy.

DISCHARGE MEASUREMENTS—Taken from the upper side of the Market Street bridge. The initial point for soundings is face of abutment on left bank.

CHANNEL—The channel is straight above and below the station for one-half mile and several hundred feet respectively. There is a low wooden dam a short distance above the bridge. Both banks are high and rocky, and not subject to overflow. The bed is composed of rock gravel and silt.

DISCHARGE MEASUREMENTS OF WEST BRANCH SUSQUEHANNA RIVER, AT WILLIAMSPORT, LYCOMING COUNTY, PA.

(Drainage area 5670 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
31	1913 Sept. 12	Hosmer, ...	682	2672	0.23	0.15	618	Surface and 0.6 msmt.

DISCHARGE TABLE FOR WEST BRANCH SUSQUEHANNA RIVER, AT WILLIAMSPORT, LYCOMING COUNTY, FROM JAN. 1, 1912 TO DEC. 31, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
0.00	250	.40	7780	.80	21900	.20	40380	.60	65500
.10	370	.50	8090	.90	22400	.30	40980	.70	66400
.20	495	.60	8400	7.00	22900	.40	41600	.80	67300
.30	630	.70	8710	.10	23400	.50	42220	.90	68200
.40	775	.80	9030	.20	23900	.60	42840	14.00	69100
.50	930	.90	9360	.30	24400	.70	43480	.10	70000
.60	1090	4.00	9690	.40	24900	.80	44120	.20	70900
.70	1260	.10	10040	.50	25400	.90	44760	.30	71800
.80	1440	.20	10400	.60	25920	11.00	45400	.40	72700
.90	1630	.30	10770	.70	26440	.10	46050	.50	73650
1.00	1820	.40	11150	.80	26960	.20	46700	.60	74600
.10	2010	.50	11540	.90	27480	.30	47350	.70	75550
.20	2210	.60	11940	8.00	28000	.40	48050	.80	76500
.30	2410	.70	12340	.10	28540	.50	48750	.90	77450
.40	2620	.80	12750	.20	29080	.60	49450	15.00	78400
.50	2830	.90	13170	.30	29620	.70	50150	.10	79400
.60	3050	5.00	13600	.40	30160	.80	50900	.20	80400
.70	3270	.10	14030	.50	30700	.90	51650	.30	81400
.80	3500	.20	14470	.60	31240	12.00	52400	.40	82400
.90	3740	.30	14910	.70	31780	.10	53150	.50	83400
2.00	3980	.40	15350	.80	32340	.20	53900	.60	84400
.10	4220	.50	15800	.90	32900	.30	54650	.70	85400
.20	4470	.60	16250	9.00	33460	.40	55450	.80	86400
.30	4720	.70	16700	.10	34020	.50	56250	.90	87400
.40	4970	.80	17150	.20	34580	.60	57050	16.00	88400
.50	5230	.90	17600	.30	35140	.70	57850	.50	93500
.60	5490	6.00	18060	.40	35700	.80	58650	17.00	98600
.70	5750	.10	18520	.50	36260	.90	59450	.50	103800
.80	6020	.20	18980	.60	36840	13.00	60300	18.00	109000
.90	6300	.30	19460	.70	37420	.10	61150	.50	114300
3.00	6580	.40	19940	.80	38000	.20	62000	19.00	119600
.10	6870	.50	20420	.90	38580	.30	62850	.50	124900
.20	7170	.60	20900	10.00	39180	.40	63700	20.00	130200
.30	7470	.70	21400	.10	39780	.50	64600	.50	135600
								21.00	141000

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF WEST BRANCH SUSQUEHANNA RIVER AT WILLIAMSPORT, LYCOMING COUNTY, PA.

1913	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	2.15	4340	4.85	13000	3.95	9520	7.60	25900	8.40	30200	7.80	27000	0.90	1630	2.80	6020	0.26	576	0.34	688	3.54	8210	2.49	5200
3, ...	2.30	4720	4.30	10800	3.90	9360	6.20	19000	7.50	25400	7.10	23400	0.90	1630	2.40	4970	0.32	659	1.12	2050	3.18	7110	2.51	5260
3, ...	2.35	4840	4.25	10600	3.65	8560	5.10	14000	4.80	12800	4.10	10000	0.80	1440	1.80	3500	0.31	644	2.75	5880	2.81	6050	2.35	4840
4, ...	2.50	5230	4.20	10400	3.27	7380	4.50	11500	4.30	10800	3.50	8090	0.80	1440	1.50	2830	0.26	576	2.80	6020	2.52	5280	2.27	4640
5, ...	2.25	4600	4.05	9860	3.10	6870	4.20	10400	4.00	9690	3.10	6870	0.80	1440	1.30	2410	0.27	590	2.70	5750	2.30	4720	2.20	4470
6, ...	3.65	8560	3.78	8870	3.00	6580	4.00	9690	3.30	7470	2.90	6300	0.90	1630	1.20	2210	0.22	522	2.70	5750	2.16	4370	2.16	4370
7, ...	2.90	6300	*3.70	8710	3.00	6580	3.70	8710	3.10	6870	2.80	6020	0.90	1630	1.20	2210	0.27	590	2.45	5100	2.26	4620	2.36	4870
8, ...	7.95	27700	†3.55	8240	2.90	6300	3.40	7780	3.00	6580	2.40	4970	0.80	1440	1.10	2010	0.26	576	2.20	4470	2.14	4320	3.09	6840
9, ...	a17.20	101000	3.60	8400	2.70	5750	3.30	7470	2.80	6020	2.30	4720	0.80	1440	1.00	1820	0.21	508	1.90	3740	2.38	4920	4.24	10500
10, ...	13.75	66800	3.45	7940	2.70	5750	3.20	7170	1.20	2210	2.10	4220	1.00	1820	1.00	1820	0.19	482	1.08	1970	8.32	29700	4.01	9720
11, ...	10.55	42500	3.45	7940	2.80	6020	3.10	6870	1.20	2210	2.00	3980	1.20	2210	1.00	1820	0.19	482	0.61	1110	d9.82	38100	3.98	9620
12, ...	8.40	30200	3.40	7780	3.10	6870	3.10	6870	0.60	1090	2.00	3980	1.20	2210	1.00	1820	0.16	445	0.85	1540	7.08	23300	3.80	9030
13, ...	8.80	32300	3.35	7620	3.30	7470	3.30	7470	0.50	930	1.90	3740	1.50	2830	0.90	1630	0.16	445	0.55	1010	6.20	19000	3.47	8000
14, ...	8.50	30700	3.40	7780	3.70	8710	3.50	8090	0.50	930	1.90	3740	1.70	3270	0.90	1630	0.18	470	0.52	962	5.56	16100	3.21	7200
15, ...	7.55	25700	3.25	7320	3.80	9030	3.60	8400	0.40	775	1.80	3500	1.80	3500	0.90	1630	0.16	445	0.63	1140	5.60	16200	2.98	6520
16, ...	6.15	18800	3.25	7320	6.90	22400	3.60	8400	0.70	1260	1.70	3270	1.70	3270	0.80	1440	0.15	432	0.59	1070	5.78	17100	2.84	6130
17, ...	5.60	16200	3.40	7780	7.10	23400	3.50	8090	0.80	1440	1.70	3270	1.70	3270	0.80	1440	0.16	445	0.57	1040	5.61	16300	2.63	5570
18, ...	4.85	13000	3.25	7320	6.20	19000	2.90	6300	0.70	1260	1.70	3270	2.00	3980	0.80	1440	0.11	382	0.78	1400	5.34	15100	2.42	5020
19, ...	8.10	28500	3.30	7470	5.80	17200	2.70	5750	0.70	1260	1.50	2830	2.00	3980	1.10	2010	0.14	420	0.82	1480	4.90	13200	2.32	4770
20, ...	8.05	28300	3.25	7320	5.30	14900	2.70	5750	0.70	1260	1.50	2830	1.90	3740	1.00	1820	0.18	470	1.23	2270	4.44	11300	2.20	4470
21, ...	8.75	32100	3.25	7320	5.10	14000	2.60	5490	0.60	1090	1.50	2830	2.00	3980	0.90	1630	0.31	644	3.72	8770	4.09	10000	2.08	4170
22, ...	9.10	34000	3.40	7780	5.20	14500	2.40	4970	0.80	1440	1.50	2830	1.80	3500	0.90	1630	2.95	6440	4.40	11200	3.82	9100	1.95	3860
23, ...	7.55	25700	3.45	7940	4.90	13200	2.30	4720	1.40	2620	1.40	2620	1.70	3270	0.70	1260	2.35	4840	3.33	7560	3.63	8490	1.86	3640
24, ...	7.30	24400	3.40	7780	4.80	12800	2.10	4220	2.20	4470	1.20	2210	2.10	4220	0.51	946	2.06	4120	2.95	6440	3.36	7660	2.62	5540
25, ...	7.05	23200	3.35	7620	5.00	13600	1.90	3740	2.60	5490	1.20	2210	5.50	15800	0.48	899	0.76	1370	2.92	6360	3.18	7110	3.37	7690
26, ...	7.35	24600	‡3.35	7620	11.50	48800	1.80	3500	4.00	9690	1.10	2010	6.70	21400	0.57	1040	0.64	1160	6.35	19700	2.92	6360	3.34	7590
27, ...	7.00	22900	3.70	8710	b18.45	114000	1.80	3500	4.30	10800	1.00	1820	6.90	22400	0.52	962	0.55	1010	c8.72	31900	2.79	5990	3.00	6580
28, ...	6.35	19700	3.85	9200	18.90	119000	2.50	5230	5.00	13600	1.00	1820	6.20	19000	0.51	946	0.52	962	7.17	23800	2.58	5440	2.76	5910
29, ...	5.70	16700	......	......	15.10	79400	11.40	48000	12.40	55400	1.00	1820	5.00	13600	0.42	806	0.41	790	5.72	16800	2.47	5150	2.68	5700
30, ...	5.35	15100	......	......	11.30	47400	10.70	43500	9.90	38600	0.90	1630	3.90	9360	0.33	674	0.32	659	4.63	12100	2.42	5020	2.56	5390
31, ...	5.00	13600	......	......	8.70	31800	......	......	8.30	29600	....	......	3.10	6870	0.30	630	....	......	3.99	9660	......	......	2.40	4970

a17.37 at 10 A. M. 102000 sec. ft. bMax. 20.40 at 10 P. M. 135000 sec. ft. cMax. 9.20 at 5 P. M. 34600 sec. ft. dMax. 10.02 at 8 A. M. 39300 sec. ft. *Frozen above dam. †Frozen at gage Feb. 8 to 25 inclusive. ‡Open under gage.

ESTIMATED MONTHLY DISCHARGE OF WEST BRANCH SUSQUEHANNA RIVER, AT WILLIAMSPORT, LYCOMING COUNTY, PA.

(Drainage area 5670 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	102000	4340	24300	4.286	4.941
February,	13000	7320	8440	1.489	1.551
March,	135000	5750	23100	4.074	4.697
April,	48000	3500	10700	1.887	2.106
May,	55400	775	9780	1.725	1.988
June,	27000	1630	5260	0.928	1.036
July,	22400	1440	5520	0.974	1.123
August,	6020	630	1870	0.330	0.380
September,	6440	382	1070	0.189	0.211
October,	34600	688	6730	1.187	1.368
November,	39300	4320	11200	1.975	2.204
December,	10500	3640	6070	1.070	1.234
The year,	135000	382	9500	1.676	22.839

BIG LOYALSOCK CREEK.

DESCRIPTION OF BASIN.

Loyalsock creek, a tributary of the West Branch of the Susquehanna river, drains an area of approximately 495 square miles in Bradford, Wyoming, Sullivan and Lycoming counties. Rising in many swamps in the western part of Wyoming county, this stream flows southwesterly through a wild, rugged and sparsely inhabited country, except on the plateaus where some farming is carried on, through Sullivan county into Lycoming county to its mouth at Montoursville, a total distance of about 60 miles. This entire stream, except for a short distance above its mouth, is steep and rapid, flowing through narrow valleys with steep, precipitous sides, with frequent low falls along its course. All but a small section of this basin near the mouth lies within the glacial area, and many of the numerous tributaries rise in lakes or swamps, the most important tributary being Little Loyalsock creek. There are a few small boroughs and farming villages on the watershed, but the stream is not used for water supply and but little for water power.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge of this stream has been measured since July 17, 1908, at Forksville, Sullivan county.

SUSQUEHANNA BASIN—STATION NO. 23.

BIG LOYALSOCK CREEK AT FORKSVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, wooden, covered highway bridge, at Forksville, Sullivan county.

RECORDS AVAILABLE—Discharge measurements and gage heights from July 17, 1908, to November 30, 1913.

DRAINAGE AREA—150 square miles.

GAGE—A standard chain gage was fastened to the upstream side of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 21.88 feet. Bench Mark No. 1 is corner of stone on left abutment, downstream corner, 10th course down under bridge seat, 2nd course up from ground, elevation 4.13 feet above gage datum. Bench Mark No. 2 is corner of stone on left abutment, upstream corner, 7th course down from bridge seat, 7th course up from bottom, elevation 6.387 feet above gage datum. The gage was read twice daily by B. W. Fawcett.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading above bridge. The initial point for soundings is outside edge of bridge seat, right side.

CHANNEL—The channel is straight for approximately 300 feet above and 200 feet below the bridge. The right bank is high and not subject to overflow, while the left bank overflows slightly during extreme high stages. The bed is composed of rocks and gravel.

REMARKS—Little Loyalsock creek enters about 800 feet below the gaging station. This station was discontinued on December 1, 1913, on account of change in channel conditions, due to a low dam which crosses the stream about 100 feet below the bridge and which is gradually being destroyed by ice floods in the creek.

DISCHARGE MEASUREMENTS OF BIG LOYALSOCK CREEK, AT FORKSVILLE, SULLIVAN COUNTY, PA.

(Drainage area 150 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
4	Nov. 12	Boehringer, ...	62	195	1.60	2.29	312	0.6 msmt. from bridge.

DAILY MEAN GAGE HEIGHTS OF BIG LOYALSOCK CREEK AT FORKSVILLE, SULLIVAN COUNTY, PA.

1913.	JAN.	FEB.	MAR.	APR.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.
DAY.	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H
1, ...	2.20	2.37	2.32	2.67	2.70	2.14	1.44	1.32	1.04	1.32	1.62
2, ...	2.30	2.36	2.24	2.60	2.57	2.04	1.51	1.30	1.04	1.54	1.62
3, ...	3.94	2.32	2.21	2.50	2.44	2.00	1.44	1.27	1.02	1.47	1.60
4, ...	3.52	2.28	2.18	2.41	2.34	1.93	1.38	1.26	1.02	1.43	1.54
5, ...	2.97	2.27	2.14	2.54	2.26	1.84	1.34	1.23	1.02	1.41	1.48
6, ...	2.84	2.26	2.10	2.54	2.21	1.77	1.34	1.22	1.02	1.37	1.47
7, ...	3.74	2.21	2.04	2.44	2.10	1.81	1.32	1.26	1.30	1.36	1.46
8, ...	3.80	2.18	2.00	2.38	2.02	1.84	1.37	1.22	1.14	1.32	1.46
9, ...	3.30	2.16	1.94	2.37	1.98	1.80	1.47	1.22	1.07	1.30	2.30
10, ...	3.04	2.12	1.91	2.33	1.96	1.71	1.77	1.22	1.07	1.27	2.77
11, ...	2.90	2.11	2.30	2.30	1.91	1.68	1.64	1.20	1.07	1.28	2.47
12, ...	3.17	2.67	2.17	2.24	1.84	1.62	1.54	1.22	1.07	1.47	2.32
13, ...	2.92	2.37	2.54	2.24	1.78	1.61	1.46	1.18	1.07	1.37	2.31
14, ...	2.83	2.02	3.30	2.24	1.73	1.57	1.42	1.17	1.10	1.32	2.27
15, ...	2.81	1.94	3.24	2.16	1.72	1.57	1.40	1.17	1.07	1.30	2.24
16, ...	2.76	1.91	3.20	2.12	1.72	1.52	1.37	1.16	1.07	1.28	2.23
17, ...	2.71	1.88	2.92	2.11	1.68	1.51	1.36	1.14	1.17	1.24	2.21
18, ...	2.72	1.83	2.70	2.07	1.67	1.48	1.33	1.12	1.13	1.24	2.18
19, ...	2.97	1.80	2.60	2.03	1.64	1.47	1.32	1.13	1.11	1.62	2.16
20, ...	2.92	1.72	2.51	2.00	1.62	1.54	1.28	1.17	1.08	2.90	2.10
21, ...	2.88	1.80	2.64	1.97	1.67	2.04	1.30	1.18	1.17	2.57	2.03
22, ...	2.87	1.97	2.67	1.93	1.82	1.77	1.27	1.22	2.04	2.24	1.98
23, ...	2.90	2.52	2.54	1.92	2.42	1.60	1.30	1.18	1.57	2.27	1.93
24, ...	2.84	2.44	2.50	1.88	2.54	1.53	1.82	1.14	1.44	1.97	1.92
25, ...	2.72	2.34	2.54	1.86	2.40	1.48	1.77	1.16	1.38	1.82	1.90
26, ...	2.60	2.24	3.52	1.82	2.30	1.47	1.60	1.11	1.34	1.94	1.87
27, ...	2.51	2.32	6.07	2.12	2.42	1.47	1.50	1.07	1.28	1.87	1.86
28, ...	2.44	2.37	3.77	5.07	2.90	1.46	1.44	1.07	1.22	1.82	1.83
29, ...	2.41	......	3.12	3.42	2.70	1.42	1.34	1.07	1.24	1.74	1.78
30, ...	2.42	......	2.80	2.84	2.47	1.42	1.27	1.04	1.32	1.71	1.77
31, ...	2.40	......	2.72	....	2.27	....	1.32	1.04	....	1.62	......

BUFFALO CREEK.

DESCRIPTION OF BASIN.

Buffalo creek, one of the smaller tributaries of the West Branch of the Susquehanna river, drains an area of approximately 128 square miles. The main stream rises in the western part of Union county, and flows in a general northeasterly direction to its mouth at Lewisburg, a distance of 21 miles. Rapid run, one of the larger tributaries of Buffalo creek, rises near the Center-Union county boundary line, and follows a general easterly course to its mouth at Cowan, Union county.

There are many tributaries to the parent stream from the north but, with the exception of a few small runs, there are practically no tributaries from the south. The largest tributaries are Little Buffalo creek, Spruce run and Rapid run, and North Branch.

The creek and its tributaries flow through a hilly, well populated agricultural region, the hillsides being covered with second growth timber. The principal towns in its watershed are Lewisburg and Mifflinburg, the latter obtaining its domestic water supply from the North Branch.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since September 8, 1913, at the covered wooden highway bridge immediately above the mouth of Little Buffalo creek, 3 miles above the mouth.

SUSQUEHANNA BASIN--STATION NO. 24.

BUFFALO CREEK NEAR LEWISBURG, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, through-truss, wooden covered bridge, known as Nogel's Bridge, about ¼ mile above mouth of Little Buffalo creek, and about 3 miles above Lewisburg, Union county.

RECORDS AVAILABLE—Discharge measurements and gage heights from September 8, to December 31, 1913.

DRAINAGE AREA—107 square miles.

GAGE—A sectional chain gage is attached to the downstream guard-rail. The elevation of zero is arbitrary. The length of chain from bottom of weight to the marker is 15.00 feet. Bench Mark No. 1 is a niche cut in the cement joint on the center of the end of the downstream wingwall of the left abutment, 5.45 feet down from top of concrete coping, elevation 9.04 feet above gage datum. The gage is read twice daily by William W. Haas.

DISCHARGE MEASUREMENTS—Taken from the downstream side of bridge, and by wading during low water below the bridge. The initial point for soundings is the top edge of the left abutment.

CHANNEL—The channel above the station curves immediately to the left and, below the station, curves immediately to the right. The right bank is subject to overflow during extreme high stages, but the left bank is high and not subject to overflow. The bed is composed of gravel, and there is a good velocity under the bridge at all stages.

DISCHARGE MEASUREMENTS OF BUFFALO CREEK, NEAR LEWISBURG, UNION COUNTY, PA.

(Drainage area 107 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
1	Aug. 18	Gannett & Hosmer,..	53	54	0.89	1.14	48	Wading msmt. below bridge.
2	Sept. 8	Hosmer, ...	52	46	0.76	1.00	35	Wading msmt. below bridge.
3	Nov. 5	Boehringer & Reckord,	117	297	0.37	1.42	110	Surface msmt.
4	Dec. 4	Reckord & Shade, ...	120	300	0.47	1.39	141	Surface msmt.

DAILY MEAN GAGE HEIGHTS OF BUFFALO CREEK NEAR LEWISBURG, UNION COUNTY, PA.

1913.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.
1,	....	1.06	1.47	1.42
2,	....	1.53	1.52	1.39
3,	....	1.36	1.39	1.57
4,	....	1.16	1.47	1.43
5,	....	1.08	1.37	1.39
6,	....	1.03	1.32	1.67
7,	....	1.08	1.22	a2.27
8,	0.95	1.03	1.22	1.99
9,	0.88	1.03	1.87	1.74
10,	0.98	1.08	1.67	1.67
11,	0.80	1.08	1.57	1.59
12,	0.90	1.23	1.62	1.47
13,	0.90	1.30	1.62	1.47
14,	1.00	1.08	1.67	1.41
15,	1.02	1.16	1.52	1.41
16,	0.94	1.03	1.69	1.37
17,	0.97	0.88	1.72	1.41
18,	0.94	1.03	1.57	1.41
19,	0.94	1.30	1.47	1.29
20,	0.91	1.76	1.42	*1.31
21,	0.99	2.10	1.32	1.27
22,	1.99	1.58	1.52	1.27
23,	1.34	1.48	1.57	1.39
24,	1.29	1.58	1.47	1.57
25,	1.09	2.43	1.42	1.47
26,	1.09	2.66	1.37	*2.04
27,	1.19	2.18	1.35	1.69
28,	1.09	2.03	1.42	†1.49
29,	1.04	1.73	1.52	†1.71
30,	0.81	1.63	1.52	†1.61
31,	....	1.48	....	†1.57

Note.—aMax. 2.69 ft. at 3.45 P. M. *Frozen above gage. †Channel closed except under gage.

SUSQUEHANNA BASIN—STATION NO. 25.

WEST BRANCH SUSQUEHANNA RIVER AT LEWISBURG, PA.

DESCRIPTION OF STATION.

LOCATION—On the Market Street bridge, Lewisburg, Union county.

RECORDS AVAILABLE—Gage heights from September 21 to December 31, 1913.

DRAINAGE AREA—6,830 square miles.

GAGE—A gage is painted on the first pier from abutment, and is graduated to feet and quarter feet. It is read twice daily by T. E. Irland.

CHANNEL—The channel is straight above and below the bridge for several hundred feet. The right bank is high and steep. The left bank is of medium height and liable to overflow during extreme high stages. The bed is composed of gravel.

DAILY MEAN GAGE HEIGHTS OF WEST BRANCH SUSQUEHANNA RIVER AT LEWISBURG, UNION COUNTY, PA.

1913.	SEPT.	OCT.	NOV.	DEC.
DAY.	G H	G H	G H	G H
1,	....	0.08	2.46	1.25
2,	....	0.17	2.12	1.25
3,	....	0.17	2.00	1.25
4,	....	0.75	1.00	1.25
5,	....	0.83	1.00	1.25
6,	....	0.92	1.00	1.00
7,	....	0.92	1.00	1.38
8,	....	0.83	1.00	1.75
9,	....	0.62	1.00	2.75
10,	....	0.46	5.00	2.75
11,	....	0.33	7.88	2.75
12,	....	0.25	6.25	2.75
13,	....	0.25	4.62	2.62
14,	....	0.17	4.00	2.25
15,	....	0.17	4.12	1.75
16,	....	0.17	4.12	1.75
17,	....	0.17	4.00	1.50
18,	....	0.17	4.00	1.50
19,	....	0.17	3.62	1.25
20,	....	0.33	3.12	1.25
21,	0.04	0.83	2.88	1.25
22,	1.04	3.00	2.62	1.25
23,	1.17	2.75	2.38	1.25
24,	0.62	2.00	1.88	1.62
25,	0.50	2.00	2.00	1.75
26,	0.42	3.16	2.00	2.00
27,	0.33	6.25	2.00	2.00
28,	0.25	5.38	1.75	2.00
29,	0.08	4.12	1.75	1.75
30,	0.08	3.50	1.50	1.75
31,	....	2.62	....	1.50

RAYSTOWN BRANCH JUNIATA RIVER.

DESCRIPTION OF BASIN.

With the Frankstown Branch, which it joins six miles below Huntingdon, the Raystown Branch forms the Juniata river. This branch rises on the eastern slope of the Allegheny mountains in the eastern part of Somerset county, and passing into Bedford county, flows easterly to near its eastern border, where it turns northward following a most tortuous course into Huntingdon county at Saxton. Through Huntingdon county it follows a winding, serpentine course, in a general northwest direction, to its mouth. The total length of the stream is approximately 110 miles, and its drainage basin comprises 1,012 square miles. The largest tributaries are Trough, Yellow, Shavers, Cove and Dunning creeks. In the western part of Bedford county the stream drains a limestone region, while its larger tributaries drain well timbered, sparsely developed areas. The tributaries coming in from the east between Hopewell and Saxton drain the Broad-top mountain soft coal district, while Great Trough creek drains the coal district at Robertsdale and Woodvale.

In Bedford county the stream and its tributaries are considerably used for domestic and industrial water supply. At Hawn's Bridge, Huntingdon county, 10 miles above the mouth, a 35-foot dam has been built, and a 2,400 h. p. water power plant erected. For over 40 miles above its mouth there is no railroad in the valley, which is quite an exception for so large a stream.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since August 31st, 1911, at Saxton, Bedford county.

SUSQUEHANNA BASIN—STATION NO. 26.

RAYSTOWN BRANCH JUNIATA RIVER AT SAXTON, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, steel, through-truss, highway bridge between Stonestown and Saxton Furnace, Bedford county.

RECORDS AVAILABLE—Discharge measurements and gage heights from August 31, 1911, to December 31, 1913.

DRAINAGE AREA—790 square miles.

GAGE—A chain gage is fastened to the floor on the drownstream side of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 23.02 feet. Bench Mark No. 1 is chiseled on stone on right downstream wing-wall, on top of stone 12th course down from top, and 5th course from bottom, elevation 9.65 feet above gage datum. The gage is read twice daily by D. R. Jenkins.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is bridge pin, right downstream side.

CHANNEL—The channel above the station curves slightly to the right, while below the station it is straight for 300 feet. Both banks are high and only overflow during extreme high stages. The bed is composed of stone, gravel and sand.

REMARKS—During low stages the current is sluggish under the right span, while under the left span there is practically no water.

DISCHARGE MEASUREMENTS OF RAYSTOWN BRANCH JUNIATA RIVER, AT SAXTON, BEDFORD COUNTY, PA.

(Drainage area 790 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
8	Aug. 1	Hosmer, ...	194	249	0.91	1.24	228	0.6 method.
9	Oct. 3	Boehringer, ...	148	411	1.53	2.28	629	0.6 method.
10	Dec. 17	Hosmer, ...	272	477	1.21	2.08	574	0.6 method.

DAILY MEAN GAGE HEIGHTS OF RAYSTOWN BRANCH JUNIATA RIVER AT SAXTON, BEDFORD COUNTY, PA.

1913.	JAN.	FEB.	MAR.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H
1,	3.01	2.45	2.62	3.20	2.13	4.08	1.18	1.16	0.77	2.11	2.33	2.25
2,	2.59	2.01	2.47	3.00	2.07	3.53	1.18	1.18	0.87	2.69	2.20	2.27
3,	2.53	2.03	2.32	3.04	1.95	3.13	1.22	1.04	0.74	2.34	2.13	2.27
4,	3.91	1.99	2.28	2.92	1.95	2.88	1.16	1.58	0.79	2.36	1.93	2.22
5,	3.26	1.93	2.14	2.70	1.81	2.53	1.19	1.50	0.81	1.96	1.86	2.19
6,	2.96	2.01	2.04	2.50	1.35	2.28	2.29	0.94	0.74	1.76	1.78	2.17
7,	3.61	1.96	2.02	2.30	1.85	2.21	1.74	1.06	0.97	1.63	1.76	2.52
8,	5.63	2.03	1.90	2.24	1.73	2.11	1.54	1.22	1.11	1.56	1.76	3.32
9,	6.46	2.79	1.87	2.07	1.88	2.08	1.42	1.22	1.11	1.53	3.48	3.62
10,	4.87	2.71	1.90	2.04	1.69	1.88	1.56	0.94	1.51	1.58	d7.18	3.12
11,	3.91	2.36	1.87	2.17	1.48	1.71	1.66	1.00	1.34	1.58	4.68	2.95
12,	4.83	2.11	2.24	2.40	1.51	1.75	1.56	1.02	1.31	1.68	3.68	2.72
13,	4.91	2.03	2.17	2.47	1.53	1.53	1.42	1.12	1.29	2.06	3.38	2.55
14,	4.26	1.99	2.24	2.17	1.57	1.51	1.26	1.08	1.17	1.80	3.13	2.45
15,	3.53	1.86	2.14	2.50	1.53	1.51	1.24	1.05	1.17	1.68	2.98	2.27
16,	3.29	1.89	2.08	3.50	1.59	1.45	1.19	1.18	1.21	1.60	3.18	2.22
17,	3.43	2.03	2.54	4.10	1.63	1.43	1.22	1.05	1.19	1.50	4.68	2.12
18,	3.33	2.01	2.52	3.72	1.65	1.45	1.22	1.05	1.27	1.56	4.13	2.08
19,	3.13	1.99	2.57	3.17	1.53	1.53	1.29	0.95	1.29	1.48	3.48	2.05
20,	3.21	1.81	2.77	2.62	1.51	1.45	1.29	1.00	1.29	2.13	3.33	1.95
21,	3.01	1.69	2.70	2.32	1.51	1.35	1.32	1.05	1.49	3.18	3.03	1.88
22,	2.81	1.69	2.47	2.27	1.51	1.43	1.10	0.95	b2.17	2.93	2.73	1.85
23,	2.69	1.81	2.30	2.24	2.11	1.45	1.16	0.99	2.17	2.43	2.46	1.85
24,	2.83	1.86	2.20	2.12	4.13	1.43	1.16	0.95	1.67	2.10	2.38	2.20
25,	3.09	1.41	2.16	2.04	3.61	*	1.10	0.92	1.59	3.68	2.23	2.75
26,	2.91	1.51	2.67	1.97	3.88	*	1.08	0.98	1.54	c5.28	2.18	2.95
27,	2.76	1.73	a5.57	2.04	7.21	1.61	1.09	0.90	1.41	5.43	2.13	3.05
28,	2.66	2.06	5.90	2.10	10.01	1.48	1.08	0.92	1.27	4.43	2.16	2.80
29,	2.50	....	4.70	2.02	7.15	1.45	1.16	0.90	1.29	3.33	2.30	2.75
30,	2.46	....	3.92	2.10	6.28	1.23	1.14	0.92	1.27	2.78	2.36	2.75
31,	2.59	....	3.52	....	4.91	....	1.12	0.85	....	2.63	....	2.60

Notes.—a Max. 6.52. at 5 p. m. b Max. 2.74. at 5 p. m. c Max. 5.88. at 5 p. m. d Max. 7.88. at 7:30 a. m. *Chain broken.

FRANKSTOWN BRANCH JUNIATA RIVER.

DESCRIPTION OF BASIN.

The Frankstown Branch of the Juniata river drains approximately 995 square miles in Bedford, Blair and Huntingdon counties. Rising in the northern part of Bedford county, this stream flows first in a general northerly direction to Hollidaysburg; thence northeasterly through Blair county to Petersburg, Huntingdon county, where it flows southeasterly to its junction with the Raystown Branch, a total distance of approximately 58 miles, the general outline of the basin being fan shaped. The headwaters lie high up on the Allegheny Mountains, but as the stream descends it enters a fertile, well settled, agricultural valley, through which it flows to Petersburg and thence through a deep gorge, cutting through a succession of ridges to its confluence, six miles below Huntingdon, with the Raystown Branch. The mountains in this basin are well covored with second growth timber, but the valleys are almost deforested. The upper section of the basin contains limestone formation, from which issues numerous large springs, which materially assist the flow in dry weather. As a whole the watershed is thickly settled, especially along the banks of the river, and its principal tributaries, of which Little Juniata is the most important, there being one city, Altoona, and many large industrial boroughs and villages scattered over the area. The river and its tributaries are extensively used for water supply, both domestic and industrial.

The source of the Frankstown Branch lies at an elevation of approximately 1,300 feet, and in a distance of 26 miles, to Hollidaysburg, (elevation 930) the flow is at the rate of 20 feet per mile; from this point to Huntingdon (elevation 610) 28 miles further downstream, the rate of fall is 12 feet per mile. The bed is rocky throughout most of its course, with gravel and sand deposits at intervals in the less rapid portions.

A concrete dam 28 feet in height, used for the generation of water power, crosses the river at Warrior Ridge, five miles above Huntingdon, creating slack water for about three miles.

The mean annual precipitation over practically the entire watershed is from 40 to 45 inches.

Discharge has been measured since May 1, 1895, at Huntingdon, six miles above the confluence with the Raystown Branch.

FRANKSTOWN BRANCH OF JUNIATA RIVER AT HUNTINGDON, PA.

DESCRIPTION OF STATION.

LOCATION—On the county wagon bridge at the foot of 4th Street, Huntingdon, Huntingdon county.

RECORDS AVAILABLE—Discharge complete May 1, 1895, to December 31, 1913.

DRAINAGE AREA—845 square miles.

GAGE—A staff gage is attached to the first pier from north side of the county bridge at the foot of 4th Street, on the downstream side. The elevation of zero is 597.4 feet above mean sea level. Bench Mark No. 1, established by the U. S. Weather Bureau, has been obliterated. Bench Mark No. 2 is the top edge of the outer corner of the left abutment, downstream side of bridge; elevation 22.50 feet above gage datum. The gage is read three times daily by Lawrence White.

DISCHARGE MEASUREMENTS—During high water measurements are obtained from the steel, three span, highway bridge about ¼ mile above the 4th Street bridge. Low water measurements obtained by wading, and at gaging station bridge. The initial point for soundings on the steel highway bridge is the end of the top angle of the handrail, left downstream side.

CHANNEL—The channel is straight both above and below the station. The right bank is low and overflows during freshets. The left bank is high and does not overflow. The bed consists of rocks, gravel and silt, with a slight grass cover during the summer season.

REMARKS—The low water readings since the spring of 1908 have been more or less affected by storage above the dam of the Penn Central Light and Power Co. at Warrior Ridge, 5 miles above Huntingdon.

DISCHARGE MEASUREMENTS OF FRANKSTOWN BRANCH JUNIATA RIVER, AT HUNTINGDON, HUNTINGDON COUNTY, PA.

(Drainage area 845 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
26	Aug. 1	Reckord & Hosmer,..	211	468	0.28	2.75	129	0.6 msmt.
27	Dec. 17	Hosmer, ...	265	977	1.30	4.21	1274	0.6 msmt.

DISCHARGE TABLE FOR FRANKSTOWN BRANCH, JUNIATA RIVER, AT HUNTINGDON, HUNTINGDON COUNTY, FROM JAN. 1, 1912

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.40	70	.90	2100	.30	7050	.80	14070	.10	24100
.50	85	5.00	2260	.40	7290	.90	14410	.20	24690
.60	100	.10	2430	.50	7540	10.00	14750	.30	25300
.70	125	.20	2600	.60	7790	.10	15100	.40	25930
.80	150	.30	2770	.70	8040	.20	15450	.50	26590
.90	175	.40	2950	.80	8300	.30	15810	.60	27250
3.00	200	.50	3140	.90	8560	.40	16180	.70	27920
.10	250	.60	3330	8.00	8820	.50	16560	.80	28600
.20	300	.70	3520	.10	9090	.60	16950	.90	29290
.30	350	.80	3710	.20	9360	.70	17350	13.00	30000
.40	400	.90	3900	.30	9640	.80	17760	.10	30720
.50	460	6.00	4100	.40	9920	.90	18180	.20	31460
.60	520	.10	4310	.50	10200	11.00	18620	.30	32220
.70	600	.20	4520	.60	10480	.10	19070	.40	33000
.80	700	.30	4730	.70	10760	.20	19530	.50	33800
.90	800	.40	4950	.80	11040	.30	20000	.60	34600
4.00	900	.50	5170	.90	11320	.40	20480	.70	35400
.10	1010	.60	5400	9.00	11600	.50	20970	.80	36200
.20	1120	.70	5630	.10	11890	.60	21460	.90	37000
.30	1250	.80	5860	.20	12180	.70	21960	14.00	37800
.40	1380	.90	6090	.30	12480	.80	22470		
.50	1510	7.00	6330	.40	12790	.90	22990		
.60	1650	.10	6570	.50	13100	12.00	23530		
.70	1800	.20	6810	.60	13420				
.80	1950			.70	13740				

Note.—This table is only applicable subsequent to January 1, 1912, and is based on 5 discharge measurements made during 1910-11-12, together with the former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF FRANKSTOWN BRANCH OF JUNIATA RIVER AT HUNTINGDON, HUNTINGDON COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.90	800	4.70	1800	4.23	1160	4.77	1900	3.83	730	4.93	2150	3.70	600	3.33	365	2.97	192	3.83	730	3.77	670	3.70	600
2,	3.93	830	3.57	502	3.97	870	4.53	1550	3.80	700	4.83	2000	3.63	544	3.27	335	3.17	285	4.70	1800	3.93	830	3.67	576
3,	4.23	1160	4.27	1210	4.10	1010	4.60	1650	3.67	576	4.43	1420	3.47	442	3.10	250	3.07	235	4.73	1840	3.67	576	3.70	600
4,	5.07	2380	4.20	1120	4.23	1160	4.43	1420	3.83	730	4.20	1120	2.73	132	3.13	265	3.03	215	4.27	1210	3.83	730	3.77	670
5,	4.50	1510	4.20	1120	3.97	870	4.13	1040	3.73	630	3.80	700	3.53	478	3.30	350	3.00	200	3.43	418	3.67	576	3.67	576
6,	4.17	1090	4.00	900	3.87	770	3.93	830	3.87	770	4.00	900	3.87	770	3.13	265	2.90	175	3.50	460	3.50	460	3.53	478
7,	5.20	2600	4.17	1090	3.97	870	4.03	930	3.73	630	3.77	670	3.57	502	3.57	502	2.83	158	3.60	520	3.40	400	4.00	900
8,	6.73	5700	3.50	460	3.53	478	4.13	1040	3.47	442	3.90	800	3.77	670	3.60	520	4.35	1320	3.53	478	3.83	730	4.93	2150
9,	6.57	5330	3.33	365	3.40	400	4.13	1040	3.50	460	4.13	1040	3.60	520	3.43	418	3.63	544	3.17	285	4.23	1160	3.53	478
10,	5.53	3200	3.97	870	4.00	900	4.10	1010	3.63	544	3.80	700	3.77	670	3.17	285	3.07	235	3.27	335	6.57	5330	4.43	1420
11,	5.47	3080	3.90	800	4.03	933	3.87	770	3.30	350	3.93	830	3.50	460	3.47	442	3.10	250	3.20	300	5.20	2600	4.40	1380
12,	6.67	5560	3.70	600	4.03	933	4.30	1250	3.43	418	3.43	418	3.23	315	3.32	365	3.07	235	2.83	158	4.73	1840	4.10	1010
13,	5.90	3900	4.10	1010	3.83	730	3.97	870	3.63	544	3.77	670	3.00	200	3.57	502	2.97	192	3.60	520	4.60	1650	4.07	977
14,	5.40	2950	3.40	400	4.83	2000	4.23	1160	3.67	576	3.23	315	3.47	442	3.00	200	3.10	250	3.37	385	4.40	1380	3.73	630
15,	5.07	2380	3.67	576	4.97	2210	4.20	1120	3.50	460	3.63	544	3.60	520	2.83	158	2.90	175	3.33	365	4.03	933	4.10	1010
16,	4.93	2150	3.50	460	4.57	1610	4.33	1290	3.90	800	3.47	442	3.43	418	3.10	250	2.97	192	2.93	182	4.43	1420	4.00	900
17,	5.43	3010	3.67	576	4.57	1610	4.07	977	3.67	576	3.57	502	2.90	175	3.10	250	3.03	215	3.07	235	4.73	1840	3.70	600
18,	5.20	2600	3.73	630	4.30	1250	4.03	933	3.50	460	3.13	265	3.10	250	3.30	350	3.00	200	3.07	235	4.47	1470	3.87	770
19,	5.27	2720	3.87	770	4.17	1090	4.17	1090	3.40	400	3.50	460	3.43	418	3.60	520	3.20	300	2.70	125	4.43	1420	3.60	520
20,	4.97	2210	3.57	502	4.17	1090	3.77	670	3.63	544	3.37	385	3.20	300	3.50	460	2.97	192	4.67	1760	4.23	1160	3.57	502
21,	4.97	2210	3.87	770	4.33	1290	3.93	830	3.27	335	4.03	933	3.23	315	2.97	192	3.57	502	4.73	1840	4.23	1160	3.20	300
22,	4.70	1800	3.87	770	4.23	1160	3.87	770	3.03	215	3.53	478	3.43	418	3.13	265	4.47	1470	4.03	933	3.87	770	3.83	730
23,	4.63	1700	3.90	800	3.83	730	3.93	830	4.00	900	3.47	442	3.43	418	3.03	215	3.73	630	3.83	730	3.70	600	3.57	502
24,	5.30	2770	3.77	670	4.07	977	3.73	630	4.37	1340	3.53	478	3.33	365	2.67	118	3.40	400	4.07	977	4.03	933	3.90	800
25,	4.93	2150	3.93	830	4.20	1120	3.77	670	3.93	830	3.10	250	3.83	730	3.23	315	3.53	478	5.80	3710	4.10	1010	3.57	502
26,	4.70	1800	3.90	800	4.97	2210	3.57	502	3.80	700	3.77	670	3.63	544	3.03	215	3.03	215	c7.47	7460	3.57	502	4.23	1160
27,	4.73	1840	3.70	600	a7.57	7720	3.50	460	b6.67	5560	4.00	900	2.73	132	3.00	200	3.00	200	6.00	4100	3.43	418	4.10	1010
28,	4.60	1650	4.60	1650	6.73	5700	4.63	1700	9.77	14000	3.50	460	3.57	502	2.97	192	2.93	182	5.13	2480	3.57	502	3.33	365
29,	4.37	1340	....	......	5.70	3520	4.40	1380	7.23	6880	3.70	600	3.80	700	3.17	285	3.03	215	4.73	1840	3.77	670	3.57	502
30,	4.27	1210	....	......	5.17	2550	3.93	830	6.00	4100	3.37	385	3.67	576	3.03	215	3.10	250	4.53	1550	4.03	933	3.50	460
31,	4.33	1290	....	......	5.00	2260	....	......	5.53	3200	....	......	3.23	315	2.70	125	....	......	4.07	977	....	......	3.57	502

Notes.—a Max. 8.3 feet at 4 p. m., 9640 sec. ft. b Max. 8.9 feet at 4 p. m., 11300 sec. ft. c Max. 8.2 feet. at 4 p. m., 9360 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF FRANKSTOWN BRANCH OF JUNIATA RIVER, AT HUNTINGDON, HUNTINGDON COUNTY, PA.

(Drainage area 845 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	5700	800	2420	2.864	3.302
February,	1800	365	809	0.957	0.997
March,	9640	400	1650	1.953	2.252
April,	1900	460	1040	1.231	1.373
May,	11300	215	1590	1.882	2.169
June,	2150	250	731	0.865	0.966
July,	770	132	446	0.528	0.609
August,	520	118	303	0.359	0.414
September,	1470	158	343	0.406	0.453
October,	9360	125	1260	1.491	1.719
November,	5330	400	1160	1.373	1.532
December,	2150	365	761	0.901	1.039
The year,	11300	118	1040	1.234	16.825

KISHACOQUILLAS CREEK.

DESCRIPTION OF BASIN.

Kishacoquillas creek, joining the Juniata river at Lewistown, 45 miles above the river's mouth, drains 195 square miles, practically all of which lie in Mifflin county. It is formed by the East and West Branches, which join at Reedville, both branches and its other tributaries rising in the sandstone ridges, while the main stream valley and those of the two branches for some miles above their junction lie in a limestone region, resulting in a well maintained flow. Its course is southwesterly and its length from Reedville is five and one-half miles, the basin being fan shaped.

The main valley is densely populated and water is used for industrial, domestic and water power purposes. Its larger upper tributaries as they emerge from the sandstone area are used for supplying Reedville, Burnham, Yeagertown and Lewistown.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since August 21, 1911, at Kulps, two miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 28.

KISHACOQUILLAS CREEK AT KULPS, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, wooden, highway bridge, known as Red Bridge, at Kulps, Mifflin county.

RECORDS AVAILABLE—Discharge complete from August 21, 1911, to December 31, 1913.

DRAINAGE AREA—190 square miles.

GAGE—A staff gage is bolted to the upstream face of the left abutment. The elevation of zero is arbitrary. Bench Mark No. 1 is a mark chiseled on stone in fourth row from top, upstream face, left abutment, elevation 5.87 feet above gage datum. The gage is read twice daily by Thomas Hawke.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading at a section 150 feet above during low stages. The initial point for soundings is the top edge of left abutment, downstream side.

CHANNEL—The channel is straight for 300 feet above and below the bridge, with a riffle about 100 feet below. The right bank is high and not subject to overflow except during extreme high stages, while the left bank is also high and is not subject to overflow. The bed is composed of rocks and mud, and there is a slight velocity under the bridge at low stages, due to the section being very deep at this point.

DISCHARGE MEASUREMENTS OF KISHACOQUILLAS CREEK, AT KULPS, MIFFLIN COUNTY, PA.

(Drainage area 190 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
8	July 22	Reckord & Hosmer,..	50	40	0.82	0.70	33	Wading 550 feet below bridge.
9	Dec. 18	Boehringer, ...	61	192	1.08	1.35	207	0.6 & surface msmt.

DISCHARGE TABLE FOR KISHACOQUILLAS CREEK, AT KULPS, MIFFLIN COUNTY, FROM JAN. 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.60	16	.20	154	.80	390	.40	795	3.00	1410
.70	34	.30	188	.90	444	.50	886	.10	1530
.80	54	.40	222	2.00	504	.60	982	.20	1660
.90	76	.50	260	.10	570	.70	1084		
1.00	100	.60	298	.20	640	.80	1189		
.10	126	.70	342	.30	714	.90	1297		

Note—This table is only applicable subsequent to Jan. 1, 1913, and is based on 4 discharge measurements made during 1912-13, together with former curve above gage height 2.40 ft.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF KISHACOQUILLAS CREEK AT KULPS, MIFFLIN COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	1.36	208	1.74	361	1.54	275	2.30	714	2.02	517	2.08	557	1.00	100	0.72	38	0.66	27	1.56	283	1.36	208	1.25	171
2,	1.35	205	1.56	283	1.46	245	2.08	557	1.92	456	1.90	444	1.00	100	0.69	32	0.66	27	1.31	191	1.27	178	1.24	168
3,	2.00	504	1.58	290	1.44	237	2.00	504	1.84	412	1.81	395	1.00	100	0.74	42	0.66	27	1.17	146	1.24	168	1.23	164
4,	2.16	612	1.57	287	1.43	233	1.90	444	1.74	361	1.71	347	0.99	98	0.73	40	0.66	27	1.08	121	1.20	154	1.14	137
5,	1.94	468	1.46	245	1.46	245	1.81	395	1.68	333	1.64	316	0.98	95	0.66	27	0.66	27	0.90	76	1.16	143	1.10	126
6,	1.82	401	1.46	245	1.41	226	1.74	361	1.64	316	1.58	290	1.11	129	0.86	67	0.65	25	0.82	58	1.12	132	1.14	137
7,	1.96	480	1.38	215	1.29	185	1.70	342	1.58	290	1.56	283	1.02	105	1.07	118	0.76	46	1.06	116	1.10	126	2.14	598
8,	2.70	1080	1.44	237	1.24	168	1.64	316	1.50	260	1.51	264	0.97	93	0.95	88	1.02	105	1.02	105	1.06	116	2.02	517
9,	2.50	886	1.39	219	1.33	198	1.52	268	1.46	245	1.44	237	0.98	95	0.61	18	0.76	46	0.88	72	2.46	850	1.76	371
10,	2.36	763	1.38	215	1.34	202	1.53	271	1.42	230	1.38	215	1.18	148	1.01	103	0.64	23	0.76	46	3.21	*1670	1.72	352
11,	2.36	763	1.37	212	1.40	222	1.60	298	1.38	215	1.36	208	1.08	121	0.90	76	0.64	23	0.88	72	1.96	480	1.67	329
12,	2.78	1170	1.30	188	1.39	219	1.68	333	1.38	215	1.32	195	1.04	110	0.91	78	0.64	23	0.73	40	1.78	380	1.60	298
13,	2.38	779	1.25	171	1.34	202	1.62	307	1.38	215	1.28	181	1.01	103	0.93	83	0.64	23	1.12	132	1.71	347	1.53	271
14,	2.31	722	1.24	168	2.40	795	1.62	307	1.37	212	1.24	168	1.00	100	0.70	34	0.90	76	1.15	140	1.66	324	1.48	252
15,	2.16	612	1.22	161	2.19	633	1.60	298	1.36	208	1.20	154	0.96	90	0.70	34	0.66	27	1.13	134	1.60	298	1.42	230
16,	2.08	557	1.24	168	2.20	640	1.62	307	1.34	202	1.22	161	0.97	93	0.90	76	0.65	25	0.73	40	1.56	283	1.40	222
17,	2.28	699	1.28	181	2.06	544	1.56	283	1.27	178	1.16	143	0.83	61	0.84	63	0.66	27	0.64	23	1.54	275	1.38	215
18,	2.20	640	1.24	168	1.96	480	1.56	283	1.26	174	1.14	137	0.73	40	0.70	34	0.66	27	0.89	74	1.48	252	1.34	202
19,	2.08	557	1.21	157	1.86	422	1.54	275	1.25	171	1.14	137	1.06	116	0.92	81	0.78	50	0.68	30	1.42	230	1.30	188
20,	2.02	517	1.20	154	1.83	406	1.44	237	1.24	168	1.18	148	0.96	90	0.66	27	0.66	27	1.54	275	1.40	222	1.28	181
21,	2.01	511	1.22	161	1.80	390	1.48	252	1.20	154	1.20	154	1.02	105	0.82	58	1.37	212	1.72	352	1.37	212	1.24	168
22,	1.94	468	1.40	222	1.74	361	1.45	241	1.27	178	1.15	140	1.16	143	0.83	61	1.47	249	1.44	237	1.32	195	1.23	164
23,	1.96	480	1.42	230	1.64	316	1.44	237	1.28	181	1.12	132	1.10	126	0.78	50	1.18	148	1.32	195	1.20	154	1.42	230
24,	2.06	544	1.31	191	1.62	307	1.42	230	1.56	283	1.07	118	1.30	188	0.99	98	1.18	148	1.30	188	1.32	195	1.70	342
25,	1.95	474	1.23	164	1.61	302	1.37	212	1.32	195	1.07	118	1.24	168	0.69	32	0.94	86	1.74	361	1.27	178	1.43	233
26,	1.92	456	1.18	148	2.24	670	1.38	215	1.28	181	1.08	121	1.12	132	0.84	63	0.84	63	2.20	640	1.25	171	1.70	342
27,	1.86	422	1.26	174	a5.06	*4050	1.68	333	1.79	385	1.12	132	1.02	105	0.73	40	0.68	30	1.90	444	1.22	161	1.66	324
28,	1.82	401	1.90	444	3.88	*2540	2.32	730	3.34	*1850	1.07	118	1.00	100	0.82	58	0.64	23	1.74	361	1.22	161	1.45	241
29,	1.76	371	....	......	3.16	1610	2.26	684	3.13	1570	1.04	110	1.02	105	0.80	54	1.10	126	1.60	298	1.37	212	1.49	256
30,	1.72	352	....	......	2.68	1060	2.13	591	2.67	1050	1.03	108	0.84	63	0.81	56	0.88	72	1.53	271	1.28	181	1.40	222
31,	1.70	342	....	......	2.52	905	....	......	2.36	763	....	......	0.75	44	0.76	46	....	......	1.38	215	....	......	1.39	219

a Max. 5.52 feet 4.45 p. m. = *4630 sec. ft. *Estimated.

ESTIMATED MONTHLY DISCHARGE OF KISHACOQUILLAS CREEK, AT KNEPS, MIFFLIN COUNTY, PA.

(Drainage area 190 square miles.)

MONTH.	Discharge in Second-feet.			Run off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	1170	205	563	2.963	3.416
February,	444	148	216	1.137	1.184
March,	*4630	168	622	3.274	3.774
April,	730	212	361	1.900	2.120
May,	*1850	154	393	2.068	2.383
June,	557	108	208	1.095	1.222
July,	188	40	105	0.553	0.638
August,	118	18	57	0.300	0.346
September,	249	23	62	0.326	0.363
October,	640	23	185	0.974	1.123
November,	*1670	116	289	1.521	1.697
December,	598	126	254	1.337	1.541
The year,	*4630	18	276	1.454	19.807

*Estimated.

TUSCARORA CREEK.

DESCRIPTION OF BASIN.

Tuscarora creek, an important tributary of the Juniata river from the south and joining that stream at Port Royal, rises in the southeastern part of Huntingdon county and flows northeasterly through that county into Juniata county, and thence in the same direction to the river. Its total length is approximately 45 miles and its total drainage area approximately 256 square miles, its watershed being long, straight and narrow. The only large tributary is Licking creek which, after flowing nearly parallel to the parent stream for several miles, joins it just above the river. Licking creek is used for industrial water supply. The valley is well cultivated as are some of the side hills, while the hill tops are well timbered. The main stream is unused for water supply and little for power.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since August 21st, 1911, at Grouinger's Bridge, four miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 29.

TUSCARORA CREEK NEAR PORT ROYAL, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, known as Groninger's Bridge, about 2 miles above Port Royal, Juniata county.

RECORDS AVAILABLE—Discharge complete from August 21, 1911, to December 31, 1913.

DRAINAGE AREA—205 square miles.

GAGE—A chain gage is bolted to the guard-rail on the downstream side of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 21.66 feet. Bench Mark No. 1 is shelf in stone on face of right abutment, 7th course from top, 2nd in from downstream corner, 0.54 feet down from top of stone, elevation 9.71 feet above gage datum. The gage is read twice daily by G. W. Groninger.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading at a section 100 feet upstream during low stages. The initial point for soundings is bridge pin, downstream right abutment.

CHANNEL—The channel is straight for 150 feet above the bridge, thence bends to the left, while below the bridge it is straight for 200 feet. The right and left banks are low, but are not subject to overflow except during extreme high stages. The bed is composed of gravel and rocks.

DISCHARGE MEASUREMENTS OF TUSCARORA CREEK, NEAR PORT ROYAL, JUNIATA COUNTY, PA.

(Drainage area 205 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
13	July 22	Reckord & Hosmer, ..	49	59	0.88	2.40	52	Wading msmt. above bridge.
14	Dec. 18	Boehringer, ...	80	117	1.05	2.94	123	0.6 msmt.

DISCHARGE TABLE FOR TUSCARORA CREEK, NEAR PORT ROYAL, JUNIATA COUNTY, FROM JAN. 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.90	0	.50	255	.20	1080	.90	2395	.60	4110
2.00	3	.60	285	.30	1145	7.00	2485	.70	4225
.10	10	.70	315	.40	1210	.10	2575	.80	4340
.20	20	.80	350	.50	1275	.20	2665	.90	4460
.30	32	.90	385	.60	1345	.30	2755	9.00	4580
.40	44	4.00	425	.70	1415	.40	2850	.10	4700
.50	57	.10	465	.80	1490	.50	2950	.20	4820
.60	70	.20	510	.90	1565	.60	3050	.30	4945
.70	85	.30	560	6.00	1640	.70	3150	.40	5080
.80	100	.40	615	.10	1715	.80	3250	.50	5215
.90	120	.50	670	.20	1790	.90	3350	.60	5350
3.00	140	.60	725	.30	1870	8.00	3455	.70	5485
.10	160	.70	780	.40	1950	.10	3560	.80	5625
.20	180	.80	835	.50	2035	.20	3665	.90	5765
.30	205	.90	890	.60	2125	.30	3775	10.00	5905
.40	230	5.00	950	.70	2215	.40	3885		
		.10	1015	.80	2305	.50	3995		

Note—This table is only applicable subsequent to Jan. 1, 1913, and is based on 4 discharge measurements made during 1912 and 1913, together with the former curve above gage height 4.1 feet.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF TUSCARORA CREEK NEAR PORT ROYAL, JUNIATA COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.66	303	3.77	340	3.32	210	4.20	510	3.90	385	3.77	340	2.39	43	2.19	19	2.08	9	2.63	74	2.97	134	2.95	130
2,	3.44	240	3.07	154	3.16	172	3.81	354	3.73	326	3.52	261	2.33	36	2.19	19	2.01	4	3.21	182	2.82	104	2.96	132
3,	4.27	545	....	150	2.94	128	3.86	371	3.52	261	3.35	218	2.33	36	2.13	13	1.98	2	2.98	136	2.84	108	2.88	116
4,	5.21	1090	....	150	3.15	170	3.61	288	3.38	225	3.22	185	2.36	39	2.26	27	1.93	1	2.95	130	2.78	97	2.96	132
5,	4.10	465	....	150	3.12	164	3.47	248	3.33	212	3.13	166	2.35	38	2.17	17	1.94	1	2.63	74	2.67	80	2.91	122
6,	3.64	297	....	150	3.05	150	3.36	220	3.24	190	3.05	150	2.85	110	2.17	17	1.94	1	2.49	56	2.62	73	2.84	108
7,	4.01	429	....	150	2.78	97	3.28	200	3.23	188	2.98	136	2.50	57	2.14	14	2.02	4	2.47	53	2.62	73	4.02	433
8,	5.09	1010	....	150	3.23	188	3.20	180	3.09	158	3.02	144	2.38	42	2.27	28	2.16	16	2.39	43	2.57	66	4.44	637
9,	5.11	1020	....	150	3.65	300	3.19	178	3.05	150	2.85	110	2.27	28	2.39	43	2.18	18	2.37	40	4.28	550	3.74	329
10,	4.31	566	....	150	2.96	132	3.14	168	3.02	144	2.83	106	2.45	50	2.19	19	2.09	9	2.27	28	5.57	1320	3.51	258
11,	4.17	496	....	100	3.19	178	3.22	185	2.98	136	2.81	102	2.71	58	2.24	25	2.03	5	2.39	43	3.98	417	3.41	232
12,	5.03	969	....	100	3.14	169	3.70	315	2.99	138	2.73	90	2.40	44	2.26	27	1 97	2	2.71	86	3.52	261	3.21	182
13,	4.54	692	....	100	3.03	146	3.49	252	2.93	126	2.65	78	2.31	33	2.19	19	1.99	3	2.74	91	3.26	195	3.16	172
14,	4.19	506	....	100	4.33	576	3.54	267	2.86	112	2.63	74	2.40	44	2.15	15	1.94	1	2.55	64	3.20	180	3.08	156
15,	3.89	382	....	100	4.76	813	3.64	297	2.89	118	2.61	72	2.39	43	2.01	4	1.97	2	2.42	47	3.05	150	2.95	130
16,	3.81	354	....	100	4.43	632	4.04	441	2.89	118	2.59	69	2.29	31	2.14	14	2.06	7	2.37	40	3.18	176	2.92	124
17,	4.24	530	....	100	3.88	378	3.81	354	2.85	110	2.51	58	2.27	28	2.11	11	1.98	2	2.43	48	3.60	285	2.95	130
18,	4.07	453	....	100	3.63	294	3.68	309	2.79	98	2.55	64	2.27	28	2.13	13	1.93	1	2.30	32	3.27	198	2.91	122
19,	3.89	382	....	100	3.49	259	3.51	258	2.79	98	2.53	61	2.35	38	2.31	33	2.12	12	2.29	31	3.12	164	2.71	86
20,	3.81	354	....	100	3.46	245	3.34	215	2.73	90	2.59	69	2.39	43	2.08	9	2.16	16	4.13	478	3.08	156	2.58	67
21,	3.74	329	....	100	3.42	235	3.23	188	2.68	82	2.65	78	2.30	32	2.00	3	4.09	461	4.37	598	3.03	146	2.81	102
22,	3.61	288	3.11	162	3.56	255	3.16	172	2.81	102	2.48	54	2.22	22	2.10	10	3.56	273	3.43	238	2.94	128	2.84	108
23,	3.49	252	3.47	248	3.27	198	3.14	168	3.01	142	2.46	52	2.25	26	2.15	15	2.71	86	3.06	152	2.92	124	2.91	122
24,	3.67	306	3.01	142	3.16	172	3.13	166	4.25	535	2.52	60	2.24	25	2.17	17	2.46	52	2.93	126	2.83	106	4.31	566
25,	3.51	258	3.17	174	3.14	168	3.09	158	3.31	208	2.46	52	2.25	26	2.14	14	2.30	32	4.35	588	2.77	96	3.58	279
26,	3.36	220	2.95	130	4.28	550	3.02	141	3.10	160	2.76	94	2.28	30	2.17	17	2.23	24	6.37	1930	2.74	91	4.29	555
27,	3.37	222	3.20	180	9.18	4800	3.80	350	4.05	445	2.67	80	2.14	14	2.10	10	2.18	18	5.13	1030	2.67	80	3.96	409
28,	3.43	238	3.37	222	6.92	2410	5.21	1090	6.92	2410	2.62	73	2.31	33	2.13	13	2.13	13	3.94	401	2.74	91	3.44	240
29,	3.25	192	....	......	5.25	1110	4.86	868	6.07	1690	2.45	50	2.22	22	1.97	2	2.23	24	3.43	238	3.12	164	3.55	270
30,	3.21	182	....	......	4.64	747	4.29	555	4.66	758	2.45	50	2.14	14	2.03	5	2.18	18	3.23	188	3.11	162	3.28	200
31,	3.27	198	....	......	4.43	631	....	......	4.23	525	....	......	2.20	20	1.93	1	....	......	3.03	146	....	......	3.18	176

Notes—Creek frozen Feb. 3 to 21, inclusive and discharge estimated from climatological records.

ESTIMATED MONTHLY DISCHARGE OF TUSCARORA CREEK, NEAR PORT ROYAL, JUNIATA COUNTY, PA.

(Drainage area 205 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	1090	182	444	2.146	2.474
February,	....	....	145	0.707	0.736
March,	4800	97	538	2.624	3.025
April,	1030	144	316	1.541	1.719
May,	2410	82	337	1.644	1.895
June,	340	50	106	0.517	0.577
July,	110	14	36	0.176	0.203
August,	43	1	16	0.078	0.090
September,	461	1	37	0.180	0.201
October,	1930	28	239	1.166	1.344
November,	1320	66	199	0.971	1.083
December,	637	67	220	1.073	1.237
The year,	4800	1	219	1.069	14.584

Note—Creek frozen Feb. 3 to 21 inclusive. Discharge estimated from climatological records.

JUNIATA RIVER.

DESCRIPTION OF BASIN.

The Juniata river, the largest tributary of the Susquehanna river, below the forks, drains a crescent shaped area of approximately 3,450 square miles lying in the southcentral part of Pennsylvania, and entirely within the Allegheny Mountains and their foot hills. This river is formed in Huntingdon county at a point six miles east of Huntingdon, by the junction of the Raystown and Frankstown Branches, the former rising on the eastern slope of the mountains in the eastern part of Somerset county, flowing eastward and then northeastward with a drainage area of approximately 1,012 square miles, and the latter rising in the northwestern part of Bedford county on the eastern slope of the Allegheny divide, and flowing northeasterly and then southeasterly, with a drainage area of approximately 995 square miles.

From the junction of the two branches, the Juniata river flows in a general easterly direction through Huntingdon, Mifflin, Juniata and Perry counties to its mouth at Juniata Bridge, a total distance of about 80 miles. The valley of the stream is narrow, bounded by high bordering hills and flows in a winding course cutting through a succession of sandstone ridges, the channel being generally on a rocky bed with numerous riffles separated by pools, in which sediment to considerable depth has collected at some points. The junction of the Frankstown and Raystown Branches lies at an approximate elevation of 610 feet and the mouth at 360 feet, making an average slope of 3 feet per mile. Draining, as this stream does, a section of the Allegheny Mountains, it has many tributaries flowing northerly and southerly between the ridges. The mountains are generally covered with second growth timber, but the larger valleys are deforested and used extensively for farming. The valleys of the river and its main tributaries are rather thickly populated, but the headwaters of the tributaries are sparsely inhabited. At one time this river was followed from its mouth to Hollidaysburg by the Pennsylvania Canal, long since abandoned, and replaced by the main line of the Pennsylvania Railroad.

The majority of the larger towns receive their domestic water supply from tributaries of the river; the river itself being thus used only in case of emergency is, however, considerably employed for industrial purposes. Several of the lower tributaries, as well as both of the branches, drain areas of limestone, which contribute to maintain a fair low water flow.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since March 21, 1899, at Newport, twelve miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 30.

JUNIATA RIVER AT NEWPORT, PA.

DESCRIPTION OF STATION.

LOCATION—On steel, through-truss, highway bridge, 800 feet east of public square at Newport, Perry county.

RECORDS AVAILABLE—Discharge complete March 21, 1899, to July 14, 1906, and from January 7, 1907, to December 31, 1913.

DRAINAGE AREA—3,380 square miles.

GAGE—A standard chain gage is attached to the handrail on the downstream side of the bridge, first span from right end. The elevation of zero is 363.32 feet above mean sea level. The length of chain from bottom of weight to the marker is 36.86 feet. Bench Mark No. 1 has been partially destroyed. Bench Mark No. 2 is on shelf in southeast corner of underpinning of store of J. M. Ewing, "B. M." cut in wall, elevation 28.87 feet above gage datum. Bench Mark No. 3 is on top of fire plug in front of Ewing's store, elevation 29.75 feet above gage datum, or 393.07 feet above mean sea level (P. R. R. Bench). The gage is read twice daily by G. A. Sweger.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, the initial point for soundings being the end of the handrail at the right end, downstream side of bridge.

CHANNEL.—The channel is straight for one-half mile both above and below the station. Both banks are high and not subject to overflow. The bed is composed of rock and gravel. The velocity is good under the bridge at all stages.

DISCHARGE MEASUREMENTS OF JUNIATA RIVER, AT NEWPORT, PERRY COUNTY, PA.

(Drainage area 3380 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
38	July 21	Boehringer & Reckord.	490	904	1.29	3.16	1166	0.6 method.

DISCHARGE TABLE FOR JUNIATA RIVER, AT NEWPORT, PERRY COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.60	470	.60	10880	.60	26780	.60	46540	.60	70120
.70	570	.70	11220	.70	27220	.70	47100	.70	70740
.80	680	.80	11560	.80	27660	.80	47660	.80	71360
.90	825	.90	11910	.90	28100	.90	48220	.90	71980
3.00	980	7.00	12260	11.00	28540	15.00	48780	19.00	72600
.10	1145	.10	12610	.10	28980	.10	49340	.10	73220
.20	1320	.20	12970	.20	29420	.20	49900	.20	73840
.30	1505	.30	13330	.30	29880	.30	50460	.30	74460
.40	1700	.40	13700	.40	30340	.40	51040	.40	75080
.50	1900	.50	14070	.50	30800	.50	51620	.50	75700
.60	2110	.60	14440	.60	31260	.60	52200	.60	76320
.70	2330	.70	14820	.70	31720	.70	52780	.70	76940
.80	2550	.80	15200	.80	32180	.80	53360	.80	77560
.90	2780	.90	15580	.90	32640	.90	53940	.90	78180
4.00	3020	8.00	15960	12.00	33100	16.00	54520	20.00	78800
.10	3270	.10	16350	.10	33580	.10	55100	.10	79420
.20	3530	.20	16740	.20	34060	.20	55680	.20	80060
.30	3800	.30	17130	.30	34540	.30	56260	.30	80700
.40	4070	.40	17520	.40	35020	.40	56840	.40	81340
.50	4350	.50	17920	.50	35500	.50	57440	.50	81980
.60	4630	.60	18320	.60	36000	.60	58040	.60	82620
.70	4910	.70	18720	.70	36500	.70	58640	.70	83260
.80	5200	.80	19120	.80	37000	.80	59240	.80	83900
.90	5490	.90	19520	.90	37500	.90	59840	.90	84540
5.00	5780	9.00	19940	13.00	38020	17.00	60440	21.00	85180
.10	6080	.10	20360	.10	38540	.10	61040	.10	85820
.20	6380	.20	20780	.20	39060	.20	61640	.20	86460
.30	6690	.30	21200	.30	39580	.30	62240	.30	87100
.40	7000	.40	21620	.40	40100	.40	62840	.40	87740
.50	7310	.50	22040	.50	40620	.50	63440	.50	88380
.60	7620	.60	22460	.60	41140	.60	64040	.60	89020
.70	7930	.70	22880	.70	41660	.70	64640	.70	89660
.80	8250	.80	23300	.80	42200	.80	65240	.80	90300
.90	8570	.90	23720	.90	42740	.90	65840	.90	90940
6.00	8890	10.00	24140	14.00	43280	18.00	66440	22.00	91580
.10	9210	.10	24580	.10	43820	.10	67040	.10	92220
.20	9540	.20	25020	.20	44360	.20	67640	.20	92860
.30	9870	.30	25460	.30	44900	.30	68260		
.40	10200	.40	25900	.40	45440	.40	68880		
.50	10540	.50	26340	.50	45980	.50	69500		

Note.—This table is only applicable subsequent to Jan. 1, 1912., and is a combination of the former curve of the Water Supply Commission of Pennsylvania, and the 1910-11 U. S. G. S. curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF JUNIATA RIVER AT NEWPORT, PERRY COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	4.75	5060	4.55	4490	4.26	3690	6.16	9410	5.07	5990	6.82	11600	3.48	1860	3.10	1140	2.90	825	3.45	1800	4.35	3940	4.20	3530
2,	4.60	4630	4.65	4770	4.51	4380	5.61	7650	4.82	5260	5.97	8790	3.28	1470	2.98	949	2.92	856	3.52	1940	4.06	3170	4.04	3120
3,	5.25	6540	4.60	4630	4.26	3690	5.31	6720	4.62	4690	5.37	6910	3.38	1660	2.98	949	2.82	709	4.10	3270	4.16	3430	4.32	3850
4,	5.95	8730	4.40	4070	4.16	3430	5.16	6260	4.42	4130	4.92	5550	3.28	1470	2.98	949	2.88	796	3.86	2690	3.85	2660	4.18	3480
5,	5.75	8090	4.35	3940	4.06	3170	4.96	5660	4.29	3770	4.67	4880	3.23	1380	3.02	1010	2.90	825	4.08	3220	3.72	2370	3.92	2830
6,	5.30	6690	4.15	3400	4.06	3170	4.76	5080	4.22	3580	4.47	4270	3.08	1110	2.99	964	2.90	825	3.72	2370	3.68	2290	3.85	2660
7,	5.10	6080	3.85	2660	3.94	2880	4.56	4520	4.12	3320	4.29	3770	3.08	1110	3.30	1500	2.90	825	3.60	2110	3.65	2220	4.15	3400
8,	5.95	8730	3.70	2330	3.78	2510	4.41	4100	4.02	3070	4.07	3200	3.53	1960	3.05	1060	2.92	856	3.41	1720	4.52	4410	5.38	6940
9,	9.75	23100	3.63	2180	3.76	2460	4.26	3690	3.97	2950	4.09	3240	3.53	1960	3.15	1230	3.05	1060	3.29	1490	3.84	2640	5.60	7620
10,	8.40	17500	3.80	2550	3.81	2570	4.18	3480	3.92	2830	3.96	2920	3.50	1900	3.10	1140	3.32	1540	3.24	1390	7.05	12400	5.26	6570
11,	6.90	11900	4.15	3400	3.96	2920	4.16	3430	3.79	2530	3.82	2600	3.43	1760	3.02	1010	3.10	1140	3.16	1250	b8.88	19400	4.81	5230
12,	6.90	11900	4.15	3400	4.01	3040	4.31	3830	3.77	2480	3.71	2350	3.56	2030	3.02	1010	2.98	949	3.16	1250	6.38	10100	4.64	4740
13,	7.80	15200	3.95	2900	4.11	3300	4.56	4520	3.77	2480	3.65	2220	3.40	1700	3.00	980	2.90	825	3.24	1390	5.38	6940	4.41	4100
14,	7.15	12800	3.70	2330	4.76	5080	4.61	4660	3.75	2440	3.57	2050	3.40	1700	3.00	980	2.90	825	3.21	1340	5.40	7000	4.32	3850
15,	6.30	9870	3.80	2550	5.86	8440	4.66	4800	3.67	2260	3.57	2050	3.26	1430	3.00	980	2.90	825	3.35	1600	4.70	4910	4.18	3480
16,	5.75	8090	3.65	2220	6.36	10100	4.81	5230	3.67	2260	3.49	1880	3.33	1560	3.00	980	2.80	680	3.31	1520	4.52	4410	4.35	3940
17,	5.65	7780	3.75	2440	5.81	8280	5.01	5810	3.77	2480	3.45	1800	3.26	1430	2.90	825	2.85	752	3.22	1360	4.56	4520	4.00	3020
18,	5.95	8730	3.75	2440	5.36	6880	5.04	5900	3.77	2480	3.45	1800	3.18	1280	2.90	825	2.90	825	3.46	1820	5.12	6140	4.20	3530
19,	5.60	7620	3.75	2440	4.96	5660	4.86	5370	3.62	2150	3.49	1880	3.06	1080	3.00	980	2.90	825	3.12	1180	5.21	6410	3.84	2640
20,	5.70	7930	3.70	2330	4.76	5080	4.66	4800	3.59	2090	3.37	1640	3.08	1110	2.90	825	2.95	902	3.90	2780	4.88	5430	3.80	2550
21,	5.45	7160	3.70	2330	4.66	4800	4.51	4380	3.57	2050	3.47	1840	3.14	1220	2.90	825	3.25	1410	4.58	4570	4.65	4770	3.75	2440
22,	5.35	6840	3.75	2440	4.66	4800	4.36	3960	3.55	2000	3.45	1800	3.06	1080	3.02	1010	4.14	3370	5.20	6380	4.42	4130	3.78	2510
23,	5.05	5930	4.05	3140	4.56	4520	4.20	3530	3.62	2150	3.52	1940	3.10	1140	3.00	980	3.52	1940	4.66	4800	4.25	3660	3.72	2370
24,	5.05	5930	4.25	3660	4.41	4100	4.11	3300	4.02	3070	3.37	1640	3.25	1410	2.90	825	3.51	1920	4.16	3430	4.12	3320	4.25	3660
25,	5.30	6690	3.90	2780	4.26	3690	4.04	3120	4.62	4690	3.37	1640	3.25	1410	2.92	856	3.24	1390	4.58	4570	4.25	3660	4.85	5340
26,	5.15	6230	3.80	2550	4.56	4520	4.01	3040	4.87	5400	3.49	1880	3.22	1360	2.89	810	3.11	1160	5.92	8630	4.12	3320	5.09	6050
27,	5.00	5780	3.70	2330	10.15	24800	4.01	3040	4.72	4970	3.62	2150	3.25	1410	2.72	592	3.60	2110	9.31	21200	3.86	2690	5.26	6570
28,	4.90	5490	4.00	3020	a12.51	35600	5.36	6880	10.77	27500	3.87	2710	3.12	1180	2.94	887	3.01	996	7.45	13900	3.84	2640	4.92	5550
29,	4.75	5060	....	....	9.86	23600	5.96	8760	15.22	50000	3.77	2480	3.02	1010	2.92	856	2.98	949	5.81	8280	3.96	2920	4.68	4850
30,	4.57	4550	....	....	8.36	17400	5.46	7190	10.32	25500	3.52	1940	3.01	966	2.88	796	3.14	1220	5.02	5840	4.05	3140	4.55	4490
31,	4.53	4430	....	....	6.76	11400	....	....	7.77	15100	....	......	3.12	1180	2.72	592	....	....	4.58	4570	......	......	4.32	3850

Note.—aMax. 12.86′ at 7 a. m.; 37300 sec. ft. bMax. 9.40′ at 8 a. m.; 21600 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF JUNIATA RIVER, AT NEWPORT, PERRY COUNTY, PA.

(Drainage area 3380 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	23100	4430	8420	2.491	2.872
February,	4770	2180	2990	0.885	0.922
March,	37300	2460	7420	2.195	2.530
April,	9410	3040	5070	1.500	1.674
May,	50000	2000	6640	1.965	2.266
June,	11600	1640	3180	0.941	1.050
July,	2030	966	1430	0.423	0.488
August,	1500	592	946	0.280	0.323
September,	3370	680	1140	0.337	0.376
October,	21200	1180	3990	1.180	1.360
November,	21600	2220	4970	1.470	1.640
December,	7620	2370	4150	1.228	1.416
The year,	50000	592	4200	1.241	16.917

CONODOGUINET CREEK.

DESCRIPTION OF BASIN.

Conodoguinet creek rises in the highlands of the west part of Franklin county, flows northeast through Franklin and Cumberland counties, joining the Susquehanna river opposite Harrisburg. Its course it tortuous and its current slow, and its valley in the lower section is deep and narrow. The total length of the creek is 75 miles and its drainage area 483 square miles. Its tributaries are generally short and unimportant, its watershed area being long and narrow. On the north the basin is bounded by a sandstone ridge, while to the south the valley is composed of rolling, limestone hills, highly cultivated. Carlisle and Mechanicsburg, and other small boroughs, lie in the valley of this stream, the former obtaining its water supply therefrom, and other towns receiving their supplies from the tributaries. It is considerably used for water power by grist mills and a few small hydro-electric plants.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since September 26th, 1911, at Brysons Bridge, 15 miles above the mouth.

CONODOGUINET CREEK AT BRYSONS BRIDGE, NEAR HOGESTOWN, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, wooden covered, highway bridge, 500 feet below Spanglers Mill, near Hogestown, Cumberland county.

RECORDS AVAILABLE—Discharge complete September 26, 1911, to December 31, 1913.

DRAINAGE AREA—460 square miles.

GAGE—A sectional chain gage is fastened on the chord of the downstream side of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 19.07 feet. Bench Mark No. 1 is the corner of protruding stone, 3rd down from the top, at bridge end of left downstream approach wall, elevation 20.70 feet above gage datum. The gage is read twice daily by Robert D. Hoy.

DISCHARGE MEASUREMENTS—Taken from floor openings on downstream side of bridge, and by wading immediately under lower side of bridge. The initial point for soundings is the top edge of the left abutment, downstream side.

CHANNEL—The channel is straight both above and below the station. The right bank is fairly high, while the left bank is low, although all flood water passes under the bridge. The bed is composed of rocks, gravel and sand.

DISCHARGE MEASUREMENTS OF CONODOGUINET CREEK, AT BRYSON'S BRIDGE, CUMBERLAND COUNTY, PA.

(Drainage area 460 square miles.)

No.	Date.		Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
17	June	30	Boehringer & Reckord,	221	322	0.61	3.01	197	Int. wading msm't. under bridge.
18	July	15	Reckord & Batley, ..	218	320	0.63	3.01	202	Int. wading msm't. under bridge.
19	Sept.	26	Boehringer & Reckord,	218	312	0.61	2.99	189	Wading msm't.
20	Oct.	21	Boehringer & Reckord,	230	950	1.95	5.80	1852	Surface msm't.
21	Oct.	22	Boehringer & Reckord,	230	697	1.48	4.71	1030	Surface msm't.
22	Dec.	16	Reckord, ...	225	397	1.11	3.31	440	Surface msm't.

DISCHARGE TABLE FOR CONODOGUINET CREEK, AT BRYSON'S BRIDGE, CUMBERLAND COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.60	127	.10	770	.60	1770	.10	3160	.60	5210
.70	155	.20	830	.70	1850	.20	3270	.70	5370
.80	185	.30	890	.80	1930	.30	3390	.80	5540
.90	217	.40	950	.90	2010	.40	3510	.90	5710
3.00	251	.50	1010	6.00	2090	.50	3640	9.00	5880
.10	287	.60	1070	.10	2170	.60	3770	.10	6060
.20	325	.70	1130	.20	2260	.70	3900	.20	6240
.30	365	.80	1200	.30	2350	.80	4030	.30	6420
.40	405	.90	1270	.40	2450	.90	4160	.40	6610
.50	450	5.00	1340	.50	2550	8.00	4300	.50	6800
.60	495	.10	1410	.60	2650	.10	4450	.60	7000
.70	545	.20	1480	.70	2750	.20	4600	.70	7200
.80	600	.30	1550	.80	2850	.30	4750	.80	7410
.90	655	.40	1620	.90	2950	.40	4900	.90	7630
4.00	710	.50	1690	7.00	3050	.50	5050	10.00	7850

Note.—This table is applicable subsequent to Jan. 1, 1912, except from June 1 to Nov. 30, 1913, when the Discharge Table for Grass Conditions applies, and is based on 2 low water discharge measurements, together with former curve.

DISCHARGE TABLE FOR GRASS CONDITIONS FOR CONODOGUINET CREEK, AT BRYSON'S BRIDGE, CUMBERLAND COUNTY, FROM JUNE 1, 1913 to DEC. 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.60	95	.70	445	.80	1100	.90	1950	7.00	3050
.70	118	.80	490	.90	1170	6.00	2050	.10	3160
.80	143	.90	540	5.00	1240	.10	2150	.20	3270
.90	168	4.00	595	.10	1310	.20	2250	.30	3390
3.00	195	.10	650	.20	1380	.30	2350	.40	3510
.10	225	.20	705	.30	1455	.40	2450	.50	3640
.20	255	.30	765	.40	1535	.50	2550	.60	3770
.30	290	.40	830	.50	1615	.60	2650	.70	3900
.40	325	.50	895	.60	1695	.70	2750	.80	4030
.50	360	.60	960	.70	1775	.80	2850	.90	4160
.60	400	.70	1030	.80	1860	.90	2950	8.00	4300

Note.—This curve is applicable from June 1st to Nov. 30, 1913, inclusive, when Grass Conditions existed and is based on 6 discharge measurements together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF CONODOGUINET CREEK AT BRYSON'S BRIDGE, CUMBERLAND COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	4.60	1070	3.56	477	3.49	446	4.52	1020	3.80	600	4.41	836	2.98	190	3.20	255	2.77	136	4.83	1120	3.64	418	3.41	410
2,	4.05	740	3.81	606	3.41	410	4.14	794	3.62	505	4.08	639	2.98	190	3.18	249	2.79	140	5.85	1900	3.62	409	3.38	397
3,	4.45	980	3.73	561	3.26	349	3.92	666	3.57	482	3.93	556	2.95	182	2.98	190	2.75	130	4.87	1150	3.36	311	3.35	385
4,	6.15	2220	3.71	550	3.13	298	3.92	666	3.52	459	3.58	392	3.02	201	3.00	195	2.79	140	4.50	895	3.32	297	3.31	369
5,	4.68	1120	3.63	510	3.21	329	3.72	556	3.37	393	3.48	353	3.05	210	2.96	184	2.82	148	4.05	622	3.36	311	3.15	306
6,	4.20	830	3.71	550	3.16	310	3.70	545	3.34	381	3.41	328	3.08	219	3.00	195	2.95	182	3.65	422	3.26	276	3.01	255
7,	4.30	890	*	460	2.99	248	3.52	459	3.34	381	3.35	308	2.98	190	c3.76	472	2.97	187	3.47	350	3.24	269	3.65	520
8,	4.75	1160	......	460	4.19	824	3.42	414	3.27	353	3.33	300	3.02	201	3.16	243	2.89	166	3.30	290	3.19	252	5.15	1440
9,	5.02	1350	......	460	3.31	369	3.42	414	3.20	325	3.31	294	3.02	201	3.20	255	2.72	123	3.07	216	3.79	486	4.43	968
10,	4.55	1040	......	460	2.93	227	3.40	405	3.10	287	3.13	234	3.00	195	3.10	225	2.79	140	2.97	187	4.79	1090	4.03	728
11,	4.22	842	......	460	3.13	298	3.37	393	3.22	333	3.25	272	3.02	201	3.10	225	2.62	100	3.17	246	4.29	759	3.85	628
12,	4.28	878	......	460	3.29	361	3.74	567	3.07	276	3.15	240	3.08	219	3.10	225	2.82	148	3.15	240	3.76	472	3.61	500
13,	4.10	770	......	460	3.29	361	4.00	710	2.97	241	3.01	198	3.05	210	3.03	204	2.77	136	3.40	325	3.62	409	3.48	441
14,	3.78	589	......	460	3.91	660	4.22	842	3.10	287	3.21	258	2.98	190	3.00	195	2.95	182	3.13	234	3.49	356	3.41	409
15,	3.65	520	......	460	6.11	2180	4.30	890	3.07	276	2.88	163	2.90	168	2.96	184	2.85	156	2.97	187	3.39	322	3.31	369
16,	3.62	505	......	460	5.41	1630	4.77	1180	3.02	258	2.88	163	2.88	163	3.00	195	2.79	140	3.00	195	3.49	356	3.23	337
17,	3.80	600	......	460	4.53	1030	4.57	1050	3.17	314	3.08	219	2.92	173	2.90	168	2.79	140	2.83	150	3.99	590	3.21	329
18,	3.90	655	3.46	432	4.19	824	4.24	854	3.04	265	2.75	130	2.90	168	2.88	163	2.82	143	2.87	160	3.86	520	3.21	329
19,	3.90	655	2.93	227	3.93	672	4.00	710	3.04	265	2.83	150	2.95	182	3.00	195	2.82	148	2.90	168	3.76	472	3.18	317
20,	3.80	600	2.91	220	3.83	616	3.84	622	2.94	231	3.13	234	2.95	182	2.93	176	2.87	160	3.43	336	3.56	384	3.18	317
21,	3.70	545	2.96	237	3.81	606	3.67	530	3.10	287	3.01	198	2.95	182	3.03	204	3.17	246	5.55	1660	3.46	346	3.11	291
22,	3.62	505	2.99	248	3.69	540	3.54	468	3.02	258	3.01	198	2.88	163	3.18	249	4.87	1150	4.87	1150	3.36	311	3.21	329
23,	3.50	450	3.33	377	3.53	464	3.47	436	3.12	295	3.01	198	2.95	182	3.10	225	3.92	551	4.20	705	3.46	346	3.14	302
24,	3.40	405	3.21	329	3.39	401	3.42	414	3.82	611	2.95	182	2.98	190	3.10	225	3.55	380	3.85	515	3.54	376	4.48	998
25,	3.60	495	3.51	454	3.31	369	3.40	405	4.02	722	2.98	190	2.92	173	3.08	219	3.17	246	6.63	2680	3.22	262	4.18	818
26,	3.45	428	3.13	298	3.69	540	3.37	393	3.60	495	3.05	210	2.92	173	3.08	219	2.99	192	d7.67	3860	3.19	252	4.81	1210
27,	3.42	414	2.93	227	7.33	3430	3.42	414	3.64	515	3.15	240	2.98	190	2.96	184	2.97	187	6.93	2980	3.26	276	5.61	1780
28,	3.42	414	3.23	337	a8.53	5100	4.40	950	6.50	2550	3.21	258	2.92	173	2.93	176	2.69	116	5.30	1460	3.14	237	4.74	1160
29,	3.45	428	......	....	5.86	1980	4.42	962	b7.04	3090	3.11	228	2.95	182	2.80	143	2.82	148	4.67	1010	3.42	332	4.21	836
30,	3.32	373	......	....	5.23	1500	4.07	752	5.37	1600	2.86	158	3.02	201	2.78	138	2.97	187	4.17	688	3.54	376	4.04	734
31,	3.28	357	......	....	4.76	1170	......	....	4.67	1110	......	......	3.10	225	2.83	150	......	....	3.97	578	......	....	3.81	606

Notes.—*Frozen, but open under gage Feb. 7 to 17 inclusive, and discharge estimated from Yellow Br. Creek at Olmsteds Mill. aMax. 9.31′ at 7:35 a. m.; 6440 sec. ft. bMax. 7.57′ at 6:10 a. m.; 3730 sec. ft. cMax. 4.13′ at 6:15 a. m.; 788 sec. ft. dMax. 8.55′ at 5:15 p. m.; 5130 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF CONODOGUINET CREEK, AT BRYSON'S BRIDGE, CUMBERLAND COUNTY, PA.

(Drainage area 460 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	2220	357	930	2.022	2.331
February,	....	....	418	0.909	0.947
March,	6440	227	921	2.002	2.308
April,	1180	393	649	1.411	1.574
May,	3730	231	595	1.294	1.492
June,	836	130	278	0.604	0.674
July,	225	163	189	0.411	0.474
August,	788	138	210	0.457	0.527
September,	1150	116	212	0.461	0.514
October,	5130	150	861	1.872	2.158
November,	1090	237	396	0.861	0.961
December,	1440	255	607	1.320	1.522
The year,	6440	116	522	1.135	15.482

Notes.—Frozen, but open under gage Feb. 7 to 17, inclusive, and discharge estimated from Yellow Breeches Creek at Olmstead Mill.

SUSQUEHANNA RIVER.

DESCRIPTION OF BASIN.

The Susquehanna river, the largest stream in the State, is formed by the junction of the North and West Branches, at Northumberland, Northumberland county, Penn'a. The North Branch, together with the section below the junction of the two branches, is now recognized as the Susquehanna river, but for convenience the old nomenclature has been retained.

From Northumberland the river follows a nearly southerly course to its junction with the Juniata river near Duncannon, Perry county, at which point it cuts through the North Mountain, turning to the southeast and continuing this course to its mouth in Chesapeake Bay, at Havre-de-Grace, Md. From Northumberland to a point about 12 miles below Columbia the river is wide and shallow, averaging about one mile in width, with a slope of 2.6 feet per mile, breaking through a series of parallel ridges in the upper portion, and crossing the Cumberland Valley in the lower portion. About 23 miles above the Maryland-Pennsylvania state line the stream enters a gorge where it crosses the Piedmont Plateau and becomes a more narrow and rapid stream, with an average fall of 6.1 feet per mile, continuing this character until it leaves the State.

The prominent tributaries are the West and North Branches, Juniata river and Pennsylvania, Sherman, Conodoguinet, Swatara, Conestoga, Pequea, Conewago, Codorus and Octoraro creeks.

The total length of the Susquehanna river from Northumberland to the state boundary is 110 miles. The drainage basin of the stream in Pennsylvania is approximately 21,320 square miles, or 47.2 per cent of the entire area of the state, while the total area tributary at the Pennsylvania-Maryland state line is approximately 27,590 square miles.

The Susquehanna river is not navigable, except locally for small, flat bottom boats, adaptable for local trade and pleasure and this only during certain seasons of the year. Canals formerly followed its banks and those of the North and West Branches, Juniata river and Swatara creek, but they are now abandoned. This entire basin is largely deforested but it is to some extent in process of regrowth. The streams are subject to sudden rises and to extremely low summer flow. There are few natural lakes or ponds in the Middle and Lower Susquehanna Sub-basins.

The nearly uniform slope, which exists from Northumberland to York Haven, is broken at the latter point by rapids, and again in the gorge below Columbia. The water power on this stream at present is developed at York Haven and McCall's Ferry.

Some of the tributaries of the West Branch and Juniata river, together with Swatara, Yellow Breeches and Conodoguinet creeks drain limestone areas. The North Branch drains the anthracite coal fields, as do certain of the tributaries of the main stream, among them Mahanoy, Shamokin, Mahantonga and Wiconisco creeks.

The chief municipalities on the main river and its tributaries below Northumberland are Sunbury, Altoona, Hollidaysburg, Tyrone, Huntingdon, Lewistown, Harrisburg, Shamokin, Shenandoah, Lebanon, York, Lancaster and Columbia. The main river, both branches and many of its tributaries are followed by the Pennsylvania or the Philadelphia and Reading Railroads.

The mean annual rainfall over the entire Susquehanna basin in Pennsylvania is approximately 41 inches.

The discharge is being measured at Harrisburg, on the main stream, and at Wilkes-Barre, Danville and Conklin, on the North Branch, Bower, Clearfield, Renovo, Williamsport and Lewisburg, on the West Branch, and Newport on the Juniata river. Prior to January 1st, 1910, the discharge was obtained on the main river at McCall's Ferry. This station was discontinued, due to the erection of a large concrete dam, near the station.

SUSQUEHANNA RIVER AT HARRISBURG, PA.

DESCRIPTION OF STATION.

LOCATION—On Walnut Street bridge, Harrisburg.

RECORDS AVAILABLE—Discharge complete from January 1, 1891, to December 31, 1913.

DRAINAGE AREA—24,100 square miles.

GAGE—A standard chain gage is fastened to the handrail on the upstream side of the bridge. The elevation of zero is 289.4 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 39.38 feet. Bench Mark No. 1 is top of upstream outer corner of bridge seat on left abutment, elevation 32.99 feet above gage datum. The gage is read twice daily by A. J. Pugh.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is end post of handrail on downstream side at left bank.

CHANNEL—The channel is straight above and below the station, and is divided into two parts by Hargest's Island. Both banks are high and not subject to overflow. The bed is composed of gravel and boulders.

REMARKS—Gage heights during portions of the year furnished by the United States Weather Bureau.

DISCHARGE TABLE FOR SUSQUEHANNA RIVER, AT HARRISBURG, DAUPHIN COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
—.04	2330	.10	53400	.30	152410	.60	286200	.90	453000
—.02	2360	.20	55020	.40	154570	.70	289000	21.00	456500
0.00	2395	.30	56660	.50	156740	.80	291800	.10	460100
.10	2610	.40	58320	.60	158920	.90	294600	.20	463800
.20	2895	.50	60000	.70	161110	16.00	297400	.30	467600
.30	3220	.60	61700	.80	163320	.10	300300	.40	471400
.40	3590	.70	63410	.90	165550	.20	303200	.50	475200
.50	3995	.80	65130	11.00	167800	.30	306100	.60	479000
.60	4435	.90	66860	.10	170100	.40	309000	.70	482800
.70	4905	6.00	68600	.20	172400	.50	311900	.80	486600
.80	5410	.10	70350	.30	174700	.60	314800	.90	490400
.90	5930	.20	72110	.40	177000	.70	317700	22.00	494200
1.00	6475	.30	73870	.50	179400	.80	320600	.10	498100
.10	7035	.40	75630	.60	181800	.90	323500	.20	502000
.20	7625	.50	77400	.70	184200	17.00	326400	.30	505900
.30	8230	.60	79200	.80	186600	.10	329400	.40	509900
.40	8900	.70	81020	.90	189000	.20	332400	.50	513900
.50	9610	.80	82860	12.00	191400	.30	335400	.60	518000
.60	10380	.90	84720	.10	193800	.40	338400	.70	522100
.70	11180	7.00	86660	.20	196200	.50	341500	.80	526200
.80	12000	.10	88500	.30	198700	.60	344600	.90	530300
.90	12835	.20	90400	.40	201200	.70	347700	23.00	534400
2.00	13690	.30	92300	.50	203700	.80	350800	.10	538500
.10	14550	.40	94200	.60	206200	.90	353900	.20	542600
.20	15410	.50	96100	.70	208700	18.00	357000	.30	546700
.30	16290	.60	98040	.80	211200	.10	360200	.40	550900
.40	17180	.70	99980	.90	213800	.20	363400	.50	555100
.50	18100	.80	101920	13.00	216400	.30	366600	.60	559300
.60	19030	.90	103860	.10	219000	.40	369800	.70	563500
.70	19980	8.00	105800	.20	221600	.50	373000	.80	567700
.80	20950	.10	107770	.30	224200	.60	376200	.90	571900
.90	21960	.20	109740	.40	226800	.70	379400	24.00	576200
3.00	23000	.30	111710	.50	229400	.80	382600	.10	580500
.10	24150	.40	113680	.60	232000	.90	385800	.20	584800
.20	25450	.50	115650	.70	234600	19.00	389000	.30	589100
.30	26800	.60	117650	.80	237200	.10	392300	.40	593400
.40	28150	.70	119650	.90	239800	.20	395600	.50	597700
.50	29500	.80	121650	14.00	242400	.30	398900	.60	602000
.60	30900	.90	123650	.10	245100	.40	402200	.70	606400
.70	32300	9.00	125650	.20	247800	.50	405500	.80	610900
.80	33750	.10	127660	.30	250500	.60	408800	.90	615400
.90	35200	.20	129670	.40	253200	.70	412100	25.00	620000
4.00	36600	.30	131680	.50	255900	.80	415400	.10	624700
.10	38050	.40	133690	.60	258600	.90	418700	.20	629400
.20	39500	.50	135700	.70	261300	20.00	422000	.30	634100
.30	41000	.60	137720	.80	264000	.10	425400	.40	638800
.40	42550	.70	139760	.90	266700	.20	428800	.50	643500
.50	44100	.80	141820	15.00	269400	.30	432200	.60	648300
.60	45650	.90	143900	.10	272200	.40	435600	.70	653100
.70	47200	10.00	146000	.20	275000	.50	439000	.80	658000
.80	48750	.10	148120	.30	277800	.60	442500	.90	662900
.90	50250	.20	150260	.40	280600	.70	446000	26.00	667800
5.00	51800			.50	283400	.80	449500		

Note.—This table is only applicable subsequent to Jan. 1, 1912, and is based on two discharge measurements made during 1912-13, together with the former curve and only affects discharge above eleven feet.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF SUSQUEHANNA RIVER AT HARRISBURG, DAUPHIN COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.55	30200	4.16	38900	3.72	32600	8.87	123000	8.97	125000	6.67	80500	1.71	11300	1.40	8900	0.40	3590	1.18	7510	3.40	28200	2.80	21000
2,	3.94	35800	4.09	37900	4.07	37600	7.47	95500	6.97	86000	5.49	59800	1.69	11100	1.31	8300	0.39	3550	1.78	11800	3.05	23600	2.74	20400
3,	4.36	41900	4.00	36600	4.38	42200	6.55	78300	5.82	65500	4.72	47500	1.52	9760	1.24	7870	0.39	3550	1.67	10900	2.72	20200	2.69	19900
4,	6.75	81900	3.79	33600	4.47	43600	5.96	67900	5.15	54200	4.20	39500	1.41	8970	1.12	7150	0.39	3550	1.54	9920	2.50	18100	2.63	19300
5,	8.05	107000	3.44	28700	4.09	37900	5.39	58200	4.45	43300	3.74	32900	1.31	8300	0.99	6420	0.39	3550	1.53	9840	2.29	16200	2.57	18800
6,	8.74	120000	3.08	23900	3.61	31000	5.18	54700	4.03	37000	3.33	27200	1.32	8360	0.96	6260	0.43	3710	1.59	10300	2.19	15300	2.50	18100
7,	7.19	90200	†2.62	19200	3.16	24900	4.76	48100	3.70	32300	3.08	23900	1.16	7390	1.17	7450	0.40	3590	1.48	9470	2.05	14100	2.53	18400
8,	6.86	84000	†2.36	16800	2.92	22200	4.52	44400	3.42	28400	2.90	22000	1.30	8230	1.15	7330	0.38	3520	1.41	8970	1.99	13600	3.05	23600
9,	11.31	175000	2.05	14100	2.79	20900	4.30	41000	3.21	25600	2.65	19500	1.78	11800	0.96	6260	0.38	3520	1.25	7930	1.94	13200	3.81	33900
10,	12.82	212000	†2.43	17500	2.62	19200	4.08	37800	2.97	22700	2.50	18100	1.67	10900	0.95	6200	0.37	3480	1.12	7150	2.76	20600	3.83	34200
11,	10.56	158000	2.38	17000	2.69	19900	3.90	35200	2.77	20700	2.39	17100	1.93	13100	0.90	5930	0.48	3910	1.04	6700	5.05	52600	3.79	33600
12,	8.85	123000	2.48	17900	3.05	23600	3.96	36000	2.58	18800	2.21	15500	2.41	17300	0.76	5210	0.41	3630	0.99	6420	7.18	90000	3.65	31600
13,	8.60	118000	2.32	16500	3.70	32300	4.24	40100	2.48	17900	2.12	14700	2.86	21600	0.76	5210	0.36	3440	0.99	6420	6.29	73700	3.47	29100
14,	9.08	127000	2.37	16900	4.49	43900	4.54	44700	2.40	17200	2.00	13700	2.39	17100	0.77	5260	0.29	3190	0.97	6310	5.43	58800	3.28	26500
15,	8.18	109000	2.30	16300	6.16	71400	4.80	48800	2.33	16600	1.92	13000	2.29	16200	0.79	5360	0.27	3120	0.98	6370	4.51	44300	3.03	23300
16,	6.94	85500	*2.39	17100	7.10	88500	4.73	47700	2.27	16000	1.81	12100	2.66	19600	0.80	5410	0.28	3150	0.99	6420	4.71	47400	2.87	21700
17,	6.17	71600	2.48	17900	8.12	108000	4.52	44400	2.20	15400	1.77	11800	2.36	16800	0.75	5160	0.23	2990	1.00	6480	4.60	45600	2.79	20900
18,	5.95	67700	2.43	17500	7.43	94800	4.29	40800	2.19	15300	1.64	10700	2.00	13700	0.69	4860	0.31	3260	0.97	6310	4.80	48800	2.67	19700
19,	6.15	71200	2.45	17600	6.28	73500	4.00	36600	2.11	14600	1.59	10300	1.78	11800	0.59	4390	0.40	3590	0.99	6420	4.77	48300	2.64	19400
20,	7.69	99800	2.56	18700	5.43	58800	3.74	32900	2.01	13800	1.58	10200	1.60	10400	0.58	4350	0.36	3440	1.18	7510	4.46	43500	2.53	18400
21,	7.70	100000	2.39	17100	4.94	50900	3.50	29500	1.99	13600	1.57	10100	1.47	9400	0.55	4220	0.45	3790	1.86	12500	4.17	39100	2.46	17700
22,	7.18	90000	2.37	16900	4.60	45600	3.29	26700	1.97	13400	1.61	10500	1.35	8560	0.55	4220	1.32	8360	2.89	21900	3.94	35800	2.35	16700
23,	6.82	83200	2.60	19000	5.00	51800	3.15	24800	1.97	13400	1.74	11500	1.23	7810	0.60	4440	1.87	12600	3.53	29900	3.68	32000	2.28	16100
24,	6.54	78100	2.69	19900	5.03	52300	3.03	23300	2.20	15400	1.71	11300	1.25	7930	0.59	4390	1.98	13500	3.39	28000	3.46	29000	2.40	17200
25,	6.50	77400	2.63	19300	4.83	49200	2.92	22200	2.54	18500	1.70	11200	1.82	12200	0.52	4080	1.66	10900	3.43	28600	3.37	27700	2.79	20900
26,	6.56	78500	2.58	18800	5.35	57500	2.82	21200	3.20	25400	1.66	10900	2.06	14200	0.49	3950	1.34	8500	3.67	31900	3.21	25600	3.59	30800
27,	6.27	73300	2.58	18800	11.27	174000	2.75	20500	3.55	30200	1.56	10100	2.40	17200	0.47	3870	1.14	7270	5.06	52800	3.00	23000	4.07	37600
28,	5.77	64600	2.93	22300	a19.21	396000	3.64	31500	4.72	47500	1.62	10500	2.09	14500	0.40	3590	0.99	6420	5.83	65600	2.87	21700	4.03	37000
29,	5.33	57200	......	......	17.91	354000	8.97	125000	8.21	110000	1.64	10700	1.83	12200	0.54	4170	0.92	6040	5.16	54400	2.83	21300	3.59	30800
30,	4.88	50000	......	......	14.70	261000	10.44	155000	8.70	120000	1.64	10700	1.60	10400	0.50	4000	0.93	6090	4.64	46300	2.81	21100	3.00	23000
31,	4.50	44100	......	......	11.32	175000	......	......	7.93	104000	....	......	1.50	9610	0.46	3830	....	......	3.95	35900	....	......	2.81	21100

*Interpolated. †Frozen under gage. aMax. 19.54′ at 5:45 p. m.; 407000 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF SUSQUEHANNA RIVER, AT HARRISBURG, DAUPHIN COUNTY, PA.

(Drainage area 24100 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	212000	30200	90500	3.755	4.329
February,	38900	14100	21200	0.880	0.916
March,	407000	19200	83700	3.473	4.004
April,	155000	20500	51200	2.124	2.369
May,	125000	13400	38600	1.602	1.847
June,	80500	10100	20200	0.838	0.935
July,	21600	7390	12200	0.506	0.583
August,	8900	3590	5420	0.225	0.260
September,	13500	2990	5090	0.211	0.235
October,	65600	6310	18200	0.755	0.870
November,	90000	13200	33700	1.398	1.560
December,	37600	16100	23900	0.992	1.143
The year,	407000	2990	33700	1.397	19.051

YELLOW BREECHES CREEK.

DESCRIPTION OF BASIN.

Yellow Breeches creek, a tributary of the lower Susquehanna river, drains an area of approximately 225 square miles. Rising in the southwestern corner of Cumberland county, it follows a northeasterly direction through the rich agricultural region of the Cumberland Valley to its mouth in the Susquehanna river at New Cumberland, the total length of the stream being approximately 50 miles. Its course is winding, particularly near its mouth, and its slope becomes less rapid as the river is approached. There are numerous small tributaries rising in the well timbered, sandstone hills, which parallel the entire watershed on the south. The creek follows closely, throughout its long and narrow watershed, the foot of these hills, while on the north the valley is wide and rolling, being underlain with limestone and producing numerous copious springs, notably Boiling Springs which are by far the largest in the State, maintaining a continuous flow of over 20,000,000 gallons per 24 hours. In the entire valley there are, owing to the presence of this limestone area, only a few small tributaries entering from the north. In the drainage basin lie many small villages, several of which obtain water supplies from the creek and its tributaries. Yellow Breeches creek is used quite extensively by grist mills for power purposes and its dry weather flow, maintained by the limestone springs, is remarkably large.

The mean annual precipitation over the greater portion of this watershed is from 35 to 40 inches, the balance receiving from 40 to 45 inches.

The discharge has been measured since March 22, 1909, at Olmsteds Mill, three miles above the mouth.

SUSQUEHANNA BASIN—STATION NO. 33.

YELLOW BREECHES CREEK AT OLMSTEDS MILL, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, at Olmsteds Mill, about one mile south of White Hill Station, Cumberland county.

RECORDS AVAILABLE—Discharge complete March 22, 1909, to October 31, 1909, and January 22, 1910, to December 31, 1913.

DRAINAGE AREA—223 square miles.

GAGE—A standard chain gage is fastened to the bottom chord eyebar, 4th downstream panel from right abutment. The elevation of zero is arbitrary. The length of chain from the bottom of weight to the marker is 15.10 feet. Bench Mark No. 1 is top of bridge seat, right abutment, outer downstream corner, elevation 13.62 feet above gage datum. The gage is read twice daily by J. P. Wrightstone,

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is the top edge of bridge seat, left abutment, downstream side.

CHANNEL—The channel is straight for 200 feet above, and for about 75 feet below the station when it bends sharply to the right. Both banks are high and not subject to overflow. The bed is composed of rock and gravel, and there is one channel at all stages.

REMARKS—There is a 4 foot wooden mill dam about 200 feet upstream from the bridge, and the tailrace from the mill comes in a little above the left abutment. Water flows over the dam at all stages. This stream keeps up a remarkably high dry weather flow on account of the limestone springs on its watershed.

DISCHARGE MEASUREMENTS OF YELLOW BREECHES CREEK, AT OLMSTEDS MILL, CUMBERLAND COUNTY, PA.

(Drainage area 223 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
24	1913. Nov. 11	Reckord, ...	124	280	0.85	1.21	238	0.6 method.

DISCHARGE TABLE FOR YELLOW BREECHES CREEK, AT OLMSTEDS MILL, CUMBERLAND COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.50	130	.10	555	.70	1305	.30	2265	.90	3650
.60	135	.20	595	.80	1360	.40	2335	7.00	3750
.70	145	.30	640	.90	1415	.50	2405	.10	3850
.80	155	.40	685	4.00	1470	.60	2480	.20	3950
.90	170	.50	730	.10	1525	.70	2560	.30	4055
1.00	185	.60	775	.20	1580	.80	2640	.40	4160
.10	205	.70	820	.30	1635	.90	2725	.50	4270
.20	230	.80	865	.40	1695	6.00	2815	.60	4380
.30	255	.90	910	.50	1755	.10	2905	.70	4495
.40	285	3.00	955	.60	1815	.20	2995	.80	4610
.50	320	.10	1005	.70	1875	.30	3085	.90	4730
.60	355	.20	1055	.80	1935	.40	3175	8.00	4850
.70	395	.30	1105	.90	1995	.50	3270		
.80	435	.40	1155	5.00	2060	.60	3365		
.90	475	.50	1205	.10	2125	.70	3460		
2.00	515	.60	1255	.20	2195	.80	3555		

Note.—This rating table is only applicable subsequent to Jan. 1, 1912, and is based on two discharge measurements made during 1912, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF YELLOW BREECHES CREEK AT OLMSTEDS MILL, CUMBERLAND COUNTY PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	1.90	475	1.34	267	1.88	467	2.32	649	1.78	427	1.44	299	0.94	176	0.92	173	0.80	155	d3.08	995	1.12	210	1.16	220
2,	1.80	435	1.28	250	1.80	435	2.04	531	1.68	387	1.35	270	0.98	182	0.93	174	0.81	156	1.90	475	1.07	199	1.15	218
3,	a2.88	901	1.24	240	1.76	419	1.98	507	1.62	363	1.30	255	0.94	176	0.84	161	0.82	158	1.50	320	1.10	205	1.12	210
4,	2.48	721	1.24	240	1.65	375	1.86	459	1.60	355	1.30	255	0.92	173	0.84	161	0.76	151	1.28	250	1.12	210	1.12	210
5,	2.03	527	1.24	240	1.71	399	1.78	427	1.54	334	1.26	245	0.92	173	0.83	160	0.78	153	1.13	212	1.06	197	1.10	205
6,	2.00	515	1.20	230	1.62	363	1.67	383	1.52	327	1.22	235	0.92	173	0.82	158	0.79	154	1.04	193	1.05	195	1.06	197
7,	2.25	618	1.21	232	1.60	355	1.61	359	1.46	306	1.18	225	0.90	170	c1.59	352	0.76	151	0.96	179	1.04	193	1.34	267
8,	2.00	515	1.20	230	1.55	338	1.58	348	1.45	302	1.14	215	0.86	164	1.01	187	0.82	158	0.92	173	1.04	193	1.73	407
9,	1.96	499	1.18	225	1.52	327	1.52	327	1.39	282	1.14	215	0.86	164	0.98	182	0.90	170	0.94	176	2.00	515	1.52	327
10,	1.90	475	1.16	220	1.55	338	1.46	306	1.35	270	1.11	208	0.88	167	0.90	170	0.83	160	0.94	176	1.48	313	1.33	264
11,	1.90	475	1.18	225	1.64	371	1.54	334	1.32	261	1.50	320	0.91	172	0.93	174	0.76	151	0.90	170	1.26	245	1.26	245
12,	1.91	479	1.18	225	1.41	288	2.39	680	1.32	261	1.80	435	0.90	170	0.94	176	0.80	155	0.86	164	1.12	210	1.24	240
13,	1.92	483	1.09	203	1.22	235	1.99	511	1.30	255	1.15	218	0.82	158	0.90	170	0.80	155	0.88	167	1.08	201	1.18	225
14,	1.87	463	1.17	222	2.32	649	2.63	788	1.30	255	1.10	205	0.87	166	0.86	164	0.74	149	0.92	173	1.07	199	1.12	210
15,	1.86	459	1.18	225	2.46	712	2.53	744	1.28	250	0.99	184	0.88	167	0.84	161	0.77	152	0.92	173	1.05	195	1.17	222
16,	1.80	435	1.17	222	2.22	604	2.80	865	1.28	250	0.96	179	0.92	173	0.84	161	0.78	153	0.88	167	1.23	238	1.14	215
17,	1.92	483	1.15	218	1.98	507	2.42	694	1.30	255	1.00	185	0.90	170	0.81	156	0.80	155	0.90	170	1.50	320	1.14	215
18,	1.90	475	1.13	212	1.81	439	2.27	626	1.27	248	0.98	182	0.88	167	0.84	161	0.87	166	0.92	173	1.23	238	1.10	205
19,	1.86	459	1.12	210	1.78	427	2.12	563	1.29	252	1.10	205	0.92	173	0.82	158	0.85	162	0.90	170	1.18	225	1.08	201
20,	1.80	435	1.12	210	1.70	395	1.90	475	1.24	240	1.20	230	0.86	164	0.82	158	0.82	158	1.12	210	1.16	220	1.08	201
21,	1.80	435	1.11	208	1.73	407	1.90	475	1.21	232	1.16	220	0.76	151	0.82	158	1.53	330	1.46	306	1.11	208	1.03	191
22,	1.80	435	1.15	218	1.60	355	1.72	403	1.24	240	1.02	189	0.84	161	0.84	161	1.92	483	1.14	215	1.10	205	1.08	201
23,	1.45	302	2.48	721	1.56	341	1.72	403	1.34	267	0.98	182	0.85	162	0.86	164	1.17	222	1.06	197	1.13	212	1.20	230
24,	1.28	250	1.98	507	1.50	320	1.68	387	1.87	463	0.95	178	0.82	158	0.84	161	0.94	176	1.03	191	1.15	218	1.30	255
25,	1.30	255	1.92	483	1.50	320	1.62	363	1.47	310	0.96	179	0.87	166	0.84	161	0.86	164	2.82	874	1.13	212	1.40	285
26,	1.31	258	1.65	375	2.00	515	1.60	355	1.32	261	1.12	210	0.86	164	0.82	158	0.80	155	2.54	748	1.08	201	2.30	640
27,	1.36	273	1.18	225	b7.09	3840	1.82	443	1.56	341	1.22	235	0.87	166	0.82	158	0.79	154	1.76	419	1.08	201	2.20	595
28,	1.30	255	1.98	507	4.90	2000	2.59	770	2.40	685	1.24	240	0.87	166	0.82	158	0.77	152	1.46	306	1.12	210	1.80	435
29,	1.28	250	......	....	3.32	1120	2.22	604	1.90	475	1.00	185	0.86	164	0.84	161	0.86	164	1.35	270	1.19	228	1.48	313
30,	1.30	255	......	....	2.40	685	1.94	491	1.66	379	0.93	174	0.84	161	0.82	158	0.88	167	1.28	250	1.17	222	1.44	299
31,	1.31	258	......	....	2.53	744	......	....	1.54	334	......	......	0.89	168	0.81	156	......	....	1.20	230	......	....	1.46	306

Notes.—aMax. 3.7′ at 4:30 p. m.; 1300 sec. ft. bMax. 7.86′ at 3 p. m.; 4680 sec. ft. cMax. 2.05′ at 7 a. m.; 535 sec. ft. dMax. 3.35′ at 7 a. m.; 1130 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF YELLOW BREECHES CREEK, AT OLMSTEADS MILL, CUMBERLAND COUNTY, PA.

(Drainage area 223 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Miuimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	1300	240	437	1.960	2.260
February,	721	203	278	1.247	1.299
March,	4680	235	616	2.762	3.184
April,	865	306	509	2.283	2.547
May,	685	232	318	1.426	1.644
June,	435	174	225	1.009	1.126
July,	182	151	167	.749	.864
August,	535	156	170	.762	.878
September,	483	149	176	0.789	0.880
October,	1130	164	287	1.287	1.484
November,	515	193	228	1.022	1.140
December,	640	191	273	1.224	1.411
The year,	4680	149	307	1.376	18.717

BIG SWATARA CREEK.

DESCRIPTION OF BASIN.

Big Swatara creek, a tributary of the Susquehanna river from Schuylkill, Berks, Lebanon and Dauphin counties, drains an approximate area of 565 square miles. Rising in the hills in the southwestern part of Schuylkill county, this stream flows in a general southwesterly direction through a broad, rolling, farming country, well inhabited and largely deforested, to its mouth at Middletown, Dauphin county, a distance of about 65 miles. On the headwaters in Schuylkill county lie numerous anthracite coal mines, the culm from which pollutes the entire stream. There are numerous tributaries, the principal being Little Swatara and Quittapahilla creeks. The sub-basins of some of the tributaries are underlain with limestone and numerous strong springs contribute to its flow. The slope is flat and the flow sluggish in the lower portion. The city of Lebanon and numerous large boroughs and villages lie on the watershed. The main stream and its branches are used to some extent for domestic and industrial supply, while numerous mill and power dams cause slack water for long stretches.

The upper part of the watershed is subject to a mean annual precipitation of from 40 to 50 inches and the lower portion from 40 to 45 inches.

The discharge has been measured at Jonestown, just above the mouth of Little Swatara creek, since November 19, 1910.

SUSQUEHANNA BASIN--STATION NO. 34.

BIG SWATARA CREEK AT JONESTOWN, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, steel, through-truss, highway bridge, at Jonestown, Lebanon county, Pa.

RECORDS AVAILABLE—Discharge complete from November 19, 1910, to December 31, 1913.

DRAINAGE AREA—190 square miles.

GAGE—A chain gage is fastened to the floor of the bridge, upper side of downstream foot walk. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 22.97 feet. Bench Mark No. 1 is niche cut in top of corner stone on 16th tier from top of left abutment, downstream face, elevation 8.49 feet above gage datum. The gage is read twice daily by an employee of the Lebanon Valley Consolidated Water Supply Co.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading under the bridge at low stages. The initial point for soundings is right face of left abutment, downstream side.

CHANNEL—The channel is straight above and below the station for 150 feet and 200 feet respectively. There is a rift above the bridge, and a pool below. Both banks are low but all water passes under the bridge during all stages. The bed is of gravel and is covered with culm.

REMARKS—There is a mill dam about 6 miles above which stores water during the night. Little Swatara creek joins the main stream about one-half mile below the station. In October, 1911, the water company put a main across the channel of the creek immediately below the gaging station, which affects the gage heights at low stages to a slight degree.

DISCHARGE MEASUREMENTS OF BIG SWATARA CREEK, AT JONESTOWN, LEBANON COUNTY, PA.

(Drainage area 190 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
20	July 9	Reckord & Batley, ..	165.5	161	0.34	3.18	54	Wading msm't. under bridge.

DISCHARGE TABLE FOR BIG SWATARA CREEK, AT JONESTOWN, LEBANON COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.90	0	.20	500	.50	1560	.80	2998	.10	4552
3.00	10	.30	565	.60	1660	.90	3114	.20	4674
.10	30	.40	630	.70	1770	7.00	3230	.30	4796
.20	60	.50	695	.80	1880	.10	3350	.40	4918
.30	90	.60	765	.90	1990	.20	3470	.50	5040
.40	125	.70	840	6.00	2100	.30	3590	.60	5162
.50	160	.80	915	.10	2210	.40	3710	.70	5284
.60	200	.90	995	.20	2320	.50	3830	.80	5406
.70	245	5.00	1080	.30	2430	.60	3950	.90	5528
.80	290	.10	1170	.40	2540	.70	4070	9.00	5650
.90	335	.20	1260	.50	2650	.80	4190		
4.00	385	.30	1360	.60	2766	.90	4310		
.10	440	.40	1460	.70	2882	8.00	4430		

Note.—This rating table is only applicable subsequent to Jan. 1, 1912, and is based on two high water discharge measurements made during 1913, together with former curve; the change having affected former tables above seven feet.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BIG SWATARA CREEK AT JONESTOWN, LEBANON COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	5.08	1150	3.80	290	3.98	375	4.89	987	5.01	1090	4.08	429	3.24	72	3.17	51	2.98	8	4.94	1030	3.74	263	3.68	236
2,	4.73	862	3.72	254	3.87	322	4.60	765	4.67	818	3.94	355	3.24	72	3.10	30	2.98	8	5.28	1340	3.68	236	3.64	218
3,	5.99	2090	3.98	375	3.73	258	4.45	662	4.45	662	3.88	326	3.24	72	3.09	28	3.01	12	4.35	598	3.62	209	3.54	176
4,	5.86	1950	4.00	385	3.79	285	4.40	630	4.33	584	3.98	375	3.22	66	3.05	20	3.05	20	3.90	335	3.57	188	3.49	156
5,	5.12	1190	3.89	330	3.76	272	4.37	610	4.21	506	3.81	294	3.20	60	3.03	16	2.99	9	3.68	236	3.52	168	3.46	146
6,	4.76	885	3.84	308	3.79	285	4.21	506	4.11	446	3.68	236	3.30	90	4.35	598	3.57	188	3.55	180	3.48	153	3.46	146
7,	4.67	818	3.58	192	3.66	227	4.10	440	4.05	412	3.64	218	3.26	78	5.45	1510	3.33	100	3.48	153	3.43	136	3.94	355
8,	4.96	1050	3.84	308	3.70	245	4.00	385	3.97	370	3.60	200	3.24	72	c3.63	213	3.45	142	3.40	125	3.40	125	4.55	730
9,	4.80	915	3.78	281	3.76	272	3.97	370	3.87	322	3.60	200	3.25	75	3.47	150	3.22	66	3.38	118	3.91	340	3.99	380
10,	4.64	795	3.82	299	3.69	240	3.91	340	3.83	304	3.52	168	3.75	268	3.37	114	3.12	36	3.34	104	4.10	440	3.72	254
11,	4.66	810	3.72	254	3.94	355	4.31	572	3.77	276	3.51	164	3.51	164	3.33	100	3.08	26	3.32	97	3.70	245	3.62	209
12,	4.79	908	3.64	218	3.88	326	4.93	1020	3.75	268	3.48	153	3.38	118	3.31	94	3.08	26	3.92	345	3.57	188	3.59	196
13,	4.57	744	3.52	168	4.09	434	5.00	1080	3.78	281	3.44	139	3.42	132	3.29	87	3.02	14	3.82	299	3.53	172	3.64	218
14,	4.37	610	3.70	245	6.64	2810	5.68	1750	3.75	268	3.42	132	3.44	139	3.25	75	2.98	8	3.62	209	3.51	164	3.76	272
15,	4.29	558	3.70	245	6.57	2730	5.24	1300	3.67	232	3.44	139	3.36	111	3.23	69	2.99	9	3.48	153	3.52	168	3.68	236
16,	4.30	565	3.80	290	6.12	2230	4.97	1050	3.70	245	3.38	118	3.24	72	3.20	60	3.01	12	3.45	142	3.71	250	3.66	227
17,	4.52	709	3.70	245	5.23	1290	4.67	818	3.64	218	3.38	118	3.22	66	3.20	60	3.02	14	3.42	132	3.88	326	3.64	218
18,	4.42	643	3.58	192	4.92	1010	4.48	682	3.61	204	3.38	118	3.24	72	3.11	33	3.12	36	3.40	125	3.77	276	3.60	200
19,	4.27	545	3.60	200	4.69	832	4.40	630	3.65	222	3.35	107	3.22	66	3.01	12	3.08	26	3.52	168	3.73	258	3.56	184
20,	4.20	500	3.53	172	4.52	709	4.27	546	3.54	176	3.34	104	3.21	63	3.03	16	3.08	26	4.26	539	3.74	263	3.54	176
21,	4.12	452	3.60	200	4.48	682	4.15	470	3.53	172	3.56	184	3.18	54	3.00	10	3.97	370	4.80	915	3.71	250	3.62	209
22,	4.06	418	3.76	272	4.36	604	4.09	434	3.54	176	3.48	153	3.18	54	3.04	18	5.11	1180	4.42	643	3.66	227	3.56	184
23,	4.04	407	4.13	458	4.12	452	4.01	390	3.71	250	3.42	132	3.22	66	3.17	51	3.78	281	4.22	513	3.56	184	3.55	180
24,	4.14	464	3.76	272	4.09	434	3.99	380	5.37	1430	3.39	122	3.25	75	3.19	57	3.49	156	4.35	598	3.53	172	4.32	578
25,	4.02	396	3.63	214	4.12	452	3.94	355	3.97	370	3.34	104	3.25	75	2.95	5	3.38	118	5.50	1560	3.48	153	3.94	355
26,	3.93	350	3.57	188	4.20	500	3.85	312	3.75	268	3.35	107	3.22	66	2.97	7	3.33	100	5.05	1120	3.47	150	5.21	1270
27,	3.96	365	3.76	272	a10.22	7120	4.20	500	4.70	840	3.32	97	3.18	54	2.99	9	3.25	75	4.80	915	3.43	136	4.69	832
28,	3.94	355	4.09	434	7.84	4240	7.45	3770	4.83	939	3.39	122	3.16	48	2.99	9	3.21	63	4.49	688	3.43	136	4.36	604
29,	3.84	308	......	....	5.94	2030	b6.49	2640	4.67	818	3.35	107	3.11	33	2.99	9	3.22	66	4.22	513	3.80	290	4.18	488
30,	3.86	317	......	....	5.36	1420	5.54	1600	4.37	610	3.24	72	3.08	26	3.01	12	3.23	69	4.02	396	3.76	272	4.08	429
31,	3.89	330	......	....	5.16	1220	......	....	4.25	532	......	......	3.11	33	3.01	12	......	....	3.89	330	......	....	*	*

aMax. 11.85′ at 6:30 p. m.; 9050 sec. ft. bMax. 8.14′ at 6 p. m.; 4600 sec ft. cMax. 6.37′ at 6 a. m.; 2510 sec. ft. *Chain broken.

ESTIMATED MONTHLY DISCHARGE OF BIG SWATARA CREEK, AT JONESTOWN, LEBANON COUNTY, PA.

(Drainage area 190 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	2090	308	724	3.811	4.394
February,	458	168	270	1.421	1.480
March,	9050	227	1120	5.895	6.796
April,	4600	312	866	4.558	5.086
May,	1430	172	462	2.432	2.804
June,	429	72	176	0.926	1.033
July,	268	26	81	0.426	0.491
August,	2510	5	114	0.600	0.692
September,	1180	8	109	0.574	0.640
October,	1340	97	472	2.484	2.864
November,	440	125	218	1.147	1.280
December,	1270	146	335	1.763	1.967
The year,	9050	5	412	2.170	29.527

POTOMAC BASIN

◆

MONOCACY RIVER.

DESCRIPTION OF BASIN.

The Monocacy river, one of the largest tributaries of the Potomac river, rises in Adams county, Pennsylvania, in two branches; namely, Rock and Marsh creeks. Rock creek rises in the central part of Adams county, in Strabane township, and flows in a southerly direction into Maryland. Marsh creek rises in the western part of Adams county, in Franklin township, and flows southeasterly to its confluence with Rock creek, about one-quarter mile below the state line, thus forming the Monocacy river. Several tributaries joining the Monocacy river, in Maryland, drain portions of southwestern and southeastern Adams county, Pennsylvania; namely, Alleway, Piney and Middle creeks. The total drainage area of the Monocacy river is approximately 940 square miles, of which 231 lie in Pennsylvania. Its length, below the confluence of Rock and Marsh creeks, is about 55 miles. The river throughout the greater portion of its course flows through a rolling, limestone country of highly cultivated farms and is polluted by washings from tanneries and mills along its banks and its tributaries. The largest towns in its watershed are Gettysburg, Pennsylvania, and Frederick Md., the former of which obtains part of its domestic water supply from Marsh creek, while the latter receives its domestic water supply from the parent stream. There are numerous small mills on its tributaries which are operated by water power.

The mean annual precipitation over this watershed, in Pennsylvania, is from 40 to 45 inches.

The discharge of this stream has been measured at Frederick, Md., since August 4th, 1896.

POTOMAC BASIN—STATION NO. 1.

MONOCACY RIVER NEAR FREDERICK, MD.

DESCRIPTION OF STATION.

LOCATION—On the county iron bridge on the turnpike four miles northeast of Frederick, on the road leading from Frederick to Mt. Pleasant, Md.

RECORDS AVAILABLE—Discharge complete from August 4, 1896, to December 31, 1913.

DRAINAGE AREA—660 square miles.

GAGE—A standard chain gage is fastened on the lower side of the bridge in the middle of the first span from the right bank. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 34.72 feet. Bench Mark No. 1 is a hole drilled in the top of a coping stone on the lower wing of the right abutment, about 100 feet back from the initial point for soundings, elevation 29.17 feet above gage datum.

DISCHARGE MEASUREMENTS—Taken from the two span highway bridge. The right channel is measured from the lower side and the left channel from the upper side. The initial point for soundings is a cross cut in the face of the parapet wall on the lower wing of the right abutment.

CHANNEL—The channel above and below the station is straight for 300 feet and 100 feet respectively. Both banks are low and liable to overflow, although all water passes under the bridge. The bed consists of gravel and cobble stones, except near the bank, which is composed of silt.

REMARKS—The data on this station have been furnished by the United States Geological Survey.

DISCHARGE TABLE FOR MONOCACY RIVER, NEAR FREDERICK, MD., FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
3.40	32	.40	734	.40	2190	.40	4060	.40	6010
.50	45	.50	790	.50	2280	.50	4155	.50	6110
.60	62	.60	846	.60	2370	.60	4250	.60	6210
.70	82	.70	904	.70	2460	.70	4345	.70	6310
.80	104	.80	964	.80	2550	.80	4440	.80	6410
.90	130	.90	1026	.90	2640	.90	4535	.90	6510
4.00	158	6.00	1090	8.00	2730	10.00	4630	12.00	6610
.10	188	.10	1155	.10	2825	.10	4725	.10	6710
.20	218	.20	1225	.20	2920	.20	4820	.20	6810
.30	250	.30	1295	.30	3015	.30	4915	.30	6915
.40	284	.40	1365	.40	3110	.40	5010	.40	7020
.50	320	.50	1440	.50	3205	.50	5110	.50	7125
.60	358	.60	1520	.60	3300	.60	5210	.60	7230
.70	398	.70	1600	.70	3395	.70	5310	.70	7335
.80	440	.80	1680	.80	3490	.80	5410	.80	7440
.90	484	.90	1765	.90	3585	.90	5510	.90	7545
5.00	530	7.00	1850	9.00	3680	11.00	5610	13.00	7650
.10	578	.10	1935	.10	3775	.10	5710		
.20	628	.20	2020	.20	3870	.20	5810		
.30	680	.30	2105	.30	3965	.30	5910		

Note.—This table is only applicable subsequent to Jan. 1, 1912, and is based on 3 low water discharge measurements made during 1913, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF MONOCACY RIVER NEAR FREDERICK, MD.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	8.9	3580	6.5	1440	5.9	1030	7.2	2020	....	1020	5.2	628	4.0	158	5.0	530	3.7	82	7.5	2280	4.8	440	4.8	440
2,	8.5	3200	6.1	1160	5.5	790	6.5	1440	....	889	5.0	530	4.0	158	7.4	2190	3.7	82	8.4	3110	4.6	358	4.7	398
3,	10.5	5110	5.8	964	5.4	734	6.9	1760	....	754	4.8	440	3.9	130	4.7	398	3.6	62	5.5	790	4.5	320	4.6	358
4,	8.9	3580	6.7	1600	5.1	578	6.7	1600	....	619	4.7	398	3.9	130	4.4	284	3.5	45	5.0	530	4.5	320	4.6	358
5,	8.1	2820	6.6	1520	5.1	578	6.5	1440	4.9	484	4.6	358	3.9	130	4.0	158	3.5	45	4.5	320	4.4	284	4.5	320
6,	7.9	2640	5.7	904	5.0	530	6.4	1360	4.7	398	4.5	320	4.2	218	3.8	104	3.5	45	4.2	218	4.4	284	4.5	320
7,	7.3	2100	5.6	846	4.9	484	6.2	1220	4.7	398	4.5	320	4.1	188	3.6	62	3.5	45	4.0	158	4.3	250	7.7	2460
8,	8.7	3400	5.6	846	4.7	398	5.9	1030	4.7	398	4.4	284	4.0	158	3.6	62	3.5	45	4.0	158	4.3	250	7.5	2280
9,	7.5	2280	5.5	790	4.7	398	5.7	904	4.6	358	4.4	284	3.9	130	3.6	62	3.4	32	3.9	130	4.8	440	5.9	1030
10,	6.5	1440	5.4	734	4.7	398	5.6	846	4.5	320	4.3	250	3.9	130	3.6	62	3.4	32	3.9	130	5.4	734	5.6	846
11,	6.4	1350	5.4	734	6.7	1600	5.6	846	4.5	320	4.3	250	3.9	130	4.6	358	3.4	32	4.2	218	4.9	484	5.4	734
12,	8.1	2820	5.3	680	5.9	1030	10.0	4630	4.5	320	4.3	250	3.9	130	4.5	320	3.4	32	4.6	358	4.8	440	5.2	628
13,	7.2	2020	4.6	358	5.6	846	9.9	4540	4.5	320	4.2	218	3.9	130	4.4	284	3.4	32	4.4	284	4.7	398	5.0	530
14,	6.1	1160	4.5	320	16.0	10800	9.7	4340	4.5	320	4.1	188	3.9	130	3.85	117	3.4	32	4.0	158	4.6	358	4.9	484
15,	5.9	1030	5.3	680	11.2	5810	10.5	5110	4.5	320	4.1	188	3.9	130	3.8	104	3.4	32	3.9	130	4.6	358	4.8	440
16,	6.4	1360	5.2	628	12.5	7120	9.2	3870	4.5	320	4.1	188	3.9	130	3.8	104	3.4	32	3.8	104	6.4	1360	4.7	398
17,	8.2	2920	5.2	628	8.6	3300	8.5	3200	4.6	358	4.1	188	3.8	104	3.7	82	3.4	32	3.8	104	7.6	2370	4.6	358
18,	7.1	1940	5.1	578	7.1	1940	7.1	1940	4.9	484	4.0	158	3.8	104	3.7	82	3.4	32	3.8	104	5.6	846	4.5	320
19,	6.9	1760	5.2	628	6.7	1600	6.9	1760	4.7	398	4.0	158	3.8	104	3.68	78	3.5	45	3.8	104	5.5	790	4.5	320
20,	6.4	1360	5.2	628	6.5	1440	6.4	1360	4.5	320	4.0	158	3.8	104	4.7	398	3.7	82	4.1	188	5.3	680	4.4	284
21,	6.2	1220	5.3	680	6.4	1360	6.3	1300	4.5	320	4.0	158	3.7	82	3.98	152	5.25	654	4.5	320	5.0	530	4.4	284
22,	6.2	1220	5.7	904	6.2	1220	5.9	1030	4.5	320	5.1	578	3.7	82	3.88	125	10.2	4820	4.6	358	4.9	484	4.4	284
23,	6.1	1160	6.3	1300	5.9	1030	5.8	964	5.5	790	4.2	218	3.6	62	3.88	125	5.4	734	4.5	320	4.8	440	6.1	1160
24,	6.1	1160	5.8	964	5.8	964	5.8	961	6.5	1440	4.2	218	3.6	62	3.76	95	5.2	628	4.4	284	4.6	358	10.5	5110
25,	6.0	1090	5.4	734	5.8	964	5.8	964	6.1	1160	4.2	218	3.5	45	3.76	95	5.0	530	13.3	7960	4.5	320	9.8	4440
26,	6.0	1090	5.2	628	6.9	1760	5.8	964	5.1	578	4.3	250	3.5	45	3.76	95	3.8	104	11.8	6410	4.4	284	13.2	7860
27,	6.0	1090	5.2	628	18.5	13400	5.8	964	7.1	1940	4.2	218	3.4	32	3.66	74	3.7	82	8.9	3580	4.4	284	8.5	3200
28,	6.4	1360	5.7	904	18.7	13600	7.2	2020	7.0	1850	4.1	188	3.5	45	3.7	82	3.7	82	7.9	2640	4.4	284	7.6	2370
29,	6.3	1300	....	......	9.1	3780	6.2	1220	6.5	1440	4.0	158	3.5	45	3.7	82	3.6	62	5.5	790	4.9	484	6.5	1440
30,	6.3	1300	....	......	8.5	3200	6.1	1160	6.0	1090	4.0	158	3.5	45	3.8	104	3.6	62	5.2	628	4.8	440	5.6	846
31,	6.2	1220	....	......	7.5	2280	....	......	5.8	964	....	......	4.5	320	3.7	82	......	......	4.9	484	....	......	5.2	628

Note.—Gage out of repair May 1-4. Discharge interpolated. Discharge provisional and subject to revision.

ESTIMATED MONTHLY DISCHARGE OF MONOCACY RIVER, NEAR FREDERICK, MD.

(Drainage area 660 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	5110	1030	1970	2.98	3.44
February,	1600	320	836	1.27	1.32
March,	13600	398	2740	4.15	4.78
April,	5110	846	1890	2.86	3.19
May,	1940	320	678	1.03	1.19
June,	628	158	271	.411	.46
July,	320	32	116	.176	.20
August,	2190	62	224	.339	.39
September,	4820	32	289	.438	.49
October,	7960	104	1080	1.64	1.89
November,	2370	250	522	.791	.88
December,	7860	284	1320	2.00	2.31
The year,	13600	32	999	1.51	20.54

Discharge provisional and subject to revision.

OHIO BASIN

ALLEGHENY RIVER.

DESCRIPTION OF BASIN.

The Allegheny river, the largest tributary of the Ohio river in Pennsylvania, draining 11,775 square miles in Pennsylvania and New York, rises in the hilly plateau on the west slope of the Allegheny mountains in northwestern Pennsylvania, at an elevation of about 2,250 feet above sea level. Its tributaries drain the west slope of these mountains from Somerset county, near the southern boundary, through the Conemaugh river, to the extreme northern boundary, and westward nearly to the Ohio line through Oil and French creeks.

Its actual source is in Potter county, in about the center of the northern border of the State, whence it flows northwesterly for about 80 miles into New York, thence about 120 miles southwesterly into Pennsylvania again, 47 miles being in New York. From this point it is 110 miles to the mouth, its junction with the Monongahela river at Pittsburgh, where the Ohio river is formed. The total length of the river is 310 miles.

In Potter and McKean counties the river and its tributaries are small mountain streams, in well wooded, steep valleys, and a sparsely inhabited region. In New York the main valley is wide and flat, the slope slight and the land under a high state of cultivation, and thickly populated. Coming back into Pennsylvania the hills converge, the valley narrowing and the slope is steeper. The population again becomes scattered, the tributary valleys well wooded, and the bordering hills are high and timbered. The larger tributaries, however, contain large areas of cleared, cultivated land, notably those from the west.

The lower 150 miles is more densely populated, many railroads and large towns and thriving industries bordering its banks, and using its waters. For 25 miles above Pittsburgh the river has been slackwatered by three dams and the banks are almost continuously populated.

For the upper 30 miles, the slope is 27 feet per mile, the next 65 miles, 2.4 feet per mile, the next 87 miles, 3.7 feet per mile, and the lower 126 miles, 2.1 feet per mile.

In the first 115 miles of its length the river bed consists mostly of fine sand and gravel, much of it lying above the terminal morain; from this point, however, the bottom changes to loose stones and boulders, riffles occur frequently, but seldom is solid rock in evidence.

The largest tributary, the Kiskiminetas river, draining 1,892 square miles, comes in 25 miles above the junction of the Monongahela and Allegheny rivers, no streams of importance joining it between. From that point up many large tributaries come in, mostly from the east, as follows: Crooked, Mahoning and Red Bank creeks, Clarion river, French, Oil, Tionesta, Brokenstraw, Conewango and Kinzua creeks, several of which drain over 1,000 square miles. Those from the west, French, Oil, Brokenstraw and Conewango drain the glaciated area, containing rounded gravel hills and numerous lakes and swamps, little timber and their watersheds are quite generally cultivated. Those from the east drain a mountainous, timbered and less inhabited and cultivated country.

The drainage basin is about 124 miles in extreme width and 175 miles in length, much narrower at its southern point, and its greatest width is at the Pennsylvania-New York State line.

The basin embraces widely varying topographic conditions, ranging from high, rough mountainous country along the east boundary, to broad, terraced valleys with wide bottom lands in New York State. In it are included the oil and gas producing regions, vast bituminous coal fields, much of the remaining merchantable timber and many other valuable natural resources.

Most of this basin lies in the zone of 40 to 45 inch rainfall, while a small portion along the southwestern part is subject to 45 to 50 inch rainfall, and another small section near the mouth to from 35 to 40 inches.

The flow is measured at Kittanning, 48 miles above Pittsburgh, and at Red House, New York, since August 18, 1904, and September 4, 1903, respectively.

OHIO BASIN—STATION NO. 1.

ALLEGHENY RIVER AT RED HOUSE, NEW YORK.

DESCRIPTION OF STATION.

LOCATION—On Red House Bridge near the station of the Erie and Pennsylvania Railroads, about 5 miles below Salamanca, N. Y.

RECORDS AVAILABLE—Discharge complete from September 4, 1903, to December 31, 1913.

DRAINAGE AREA—1,640 square miles.

GAGE—A standard chain gage is fastened to the upstream side of the bridge near middle of left span. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 24.16 feet. Bench Mark No. 1 is a circle cut on the downstream side of the left abutment, elevation 21.09 feet above gage datum. The gage is read by O. A. Gates.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is left end of downstream side of bridge.

CHANNEL—The channel is straight above and below the station for 800 feet. The right bank is high and not subject to overflow. The left bank is subject to overflow during extreme flood stages. The bed is composed of gravel and is smooth.

REMARKS—The channel is 494 feet wide between abutments, broken by two piers. At extreme high stages there is an additional flood channel on the left bank.

The following data have been furnished by the United States Geological Survey:

DISCHARGE MEASUREMENTS OF ALLEGHENY RIVER, AT RED HOUSE, N. Y.

(Drainage area 1640 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
32	Jan. 21	DeGolyer, ...	368	2740	4.85	8.35	13300	0.2 and 0.8 msmt.
33	March 29	DeGolyer, ...	355	3830	7.23	11.27	27700	Surf. msmt.
34	May 1	DeGolyer, ...	354	2700	4.26	7.96	11500	0.2 and 0.8 msmt.
35	May 1	DeGolyer, ...	354	2580	4.03	7.72	10400	0.2 and 0.8 msmt.
36	Aug. 12	Canfield, ...	330	1000	0.36	3.25	358	0.2 and 0.8 msmt.
37	Aug. 12	Canfield, ...	330	1010	0.34	3.22	341	0.2 and 0.8 msmt.

DISCHARGE TABLE FOR ALLEGHENY RIVER, AT RED HOUSE, N. Y., FROM JAN. 1, 1912 to MARCH 31, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.40	41	.50	2000	.60	6780	.70	14550	.80	25100
.50	70	.60	2160	.70	7080	.80	15000	.90	25650
.60	106	.70	2320	.80	7390	.90	15450	11.00	26200
.70	150	.80	2490	.90	7720	9.00	15900	.10	26750
.80	200	.90	2670	7.00	8050	.10	16350	.20	27300
.90	256	5.00	2860	.10	8400	.20	16800	.30	27850
3.00	318	.10	3060	.20	8750	.30	17300	.40	28400
.10	386	.20	3260	.30	9100	.40	17800	.50	28950
.20	460	.30	3470	.40	9450	.50	18300	.60	29500
.30	540	.40	3690	.50	9800	.60	18800	.70	30050
.40	626	.50	3910	.60	10150	.70	19300	.80	30600
.50	722	.60	4140	.70	10500	.80	19800	.90	31200
.60	828	.70	4370	.80	10850	.90	20300	12.00	31800
.70	940	.80	4610	.90	11250	10.00	20800	.10	32400
.80	1060	.90	4850	8.00	11650	.10	21300	.20	33000
.90	1180	6.00	5100	.10	12050	.20	21800	.30	33600
4.00	1305	.10	5360	.20	12450	.30	22350	.40	34200
.10	1435	.20	5630	.30	12850	.40	22900	.50	34800
.20	1570	.30	5910	.40	13250	.50	23450		
.30	1710	.40	6190	.50	13650	.60	24000		
.40	1850	.50	6480	.60	14100	.70	24550		

DISCHARGE TABLE FOR ALLEGHENY RIVER, AT RED HOUSE, N. Y., FROM APRIL 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
2.80	100	.30	1590	.80	4570	.30	9100	.80	15000
.90	150	.40	1740	.90	4830	.40	9450	.90	15450
3.00	200	.50	1900	6.00	5090	.50	9800	9.00	15900
.10	260	.60	2070	.10	5360	.60	10150	.10	16350
.20	330	.70	2240	.20	5630	.70	10500	.20	16800
.30	410	.80	2420	.30	5910	.80	10850	.30	17300
.40	500	.90	2610	.40	6190	.90	11250	.40	17800
.50	600	5.00	2800	.50	6480	8.00	11650	.50	18300
.60	700	.10	3000	.60	6780	.10	12050	.60	18800
.70	810	.20	3200	.70	7080	.20	12450	.70	19300
.80	920	.30	3410	.80	7390	.30	12850	.80	19800
.90	1040	.40	3630	.90	7720	.40	13250	.90	20300
4.00	1170	.50	3850	7.00	8050	.50	13650	10.00	20800
.10	1300	.60	4080	.10	8400	.60	14100		
.20	1440	.70	4320	.20	8750	.70	14550		

Note.—This table is only applicable subsequent to April 1, 1913, and is based on 8 discharge measurements made during 1912 and 1913 and coincides with former curve above gage height 6.1 ft.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF ALLEGHENY RIVER, AT REDHOUSE, N. Y.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	4.6	2160	4.8	2490	5.4	3690	7.2	8750	7.8	10800	4.45	1820	3.3	410	3.1	260	3.0	200	3.2	330	3.45	550	4.1	1300
2, ...	4.8	2490	4.6	2160	5.0	2860	6.5	6480	7.3	9100	4.6	2070	3.35	455	3.1	260	3.0	200	3.5	600	3.75	865	4.15	1370
3, ...	5.0	2860	4.4	1850	4.7	2320	6.1	5360	6.6	6780	4.0	1170	3.4	500	3.15	295	3.05	230	3.55	650	3.9	1040	4.1	1300
4, ...	5.8	4610	4.4	1850	4.6	2160	6.0	5090	5.4	3630	4.25	1520	3.3	410	3.05	230	3.0	200	3.45	550	4.0	1170	4.0	1170
5, ...	6.0	5100	4.15	1500	5.0	2860	6.6	6780	5.2	3200	4.2	1440	3.3	410	3.05	230	3.15	295	3.30	410	3.85	980	4.1.	1300
6, ...	5.8	4610	4.2	1570	5.0	2860	6.0	5090	5.2	3200	4.25	1520	3.2	330	3.25	370	3.1	260	3.45	550	4.0	1170	4.05	1240
7, ...	7.7	10500	4.0	1300	5.2	3260	5.9	4830	5.7	4320	4.4	1740	3.2	330	3.3	410	3.2	330	3.4	500	4.05	1240	4.1	1300
8, ...	10.2	21800	4 0	1300	5.0	2860	5.6	4080	5.4	3630	4.2	1440	3.55	650	3.3	410	3.25	370	3.3	410	4.0	1170	4.1	1300
9, ...	10.3	22400	3.85	1120	5.2	3260	5.4	3630	5.2	3200	4.15	1370	3.45	550	3.25	370	3.1	260	3.3	410	5.7	4320	4.2	1440
10, ...	10.0	20800	3.9	1180	5.2	3260	5.6	4080	4.9	2610	4.0	1170	3.4	500	3.1	260	3.15	295	3.45	550	5.6	4080	4.1	1300
11, ...	9.6	18800	3.8	1060	5.8	4610	5.6	4080	4.95	2700	3.75	865	3.35	455	3.1	260	3.0	200	3.35	455	5.4	3630	4.0	1170
12, ...	9.6	18800	3.8	1060	6.4	6190	5.6	4080	4.85	2520	3.75	865	3.4	500	3.1	260	3.0	200	3.4	500	5.6	4080	4.1	1300
13, ...	9.0	15900	3.7	940	6.0	5100	5.3	3410	4.9	2610	3.65	755	3.3	410	3.05	230	3.0	200	3.45	550	6.5	6480	4.05	1240
14, ...	7.7	10500	3.65	884	6.6	6780	5.2	3200	4.35	1660	3.6	700	3.3	410	3.1	260	3.1	260	3.3	410	6.5	6480	4.2	1440
15, ...	7.0	8050	3.7	940	6.9	7720	5.2	3200	4.15	1370	3.65	755	3.4	500	3.05	230	3.1	260	3.35	455	6.6	6780	4.35	1660
16, ...	6.7	7080	3.9	1180	6.4	6190	5.0	2800	3.9	1040	3.7	810	3.3	410	3.05	230	3.1	260	3.3	410	6.6	6780	4.25	1520
17, ...	7.9	11200	3.7	940	5.9	4850	4.9	2610	3.8	920	3.5	600	3.65	755	3.2	330	3.1	260	3.4	500	6.5	6480	4.2	1440
18, ...	9.1	16400	3.85	1120	5.6	4140	4.7	2240	3.75	865	3.65	755	3.55	650	3.2	330	3.1	260	3.35	455	6.0	5090	4.2	1440
19, ...	8.8	15000	4.25	1640	5.3	3470	4.75	2330	3.55	650	3.65	755	3.35	455	3.35	455	3.05	230	3.3	410	6.0	5090	4.15	1370
20, ...	7.8	10800	5.4	3690	5.2	3260	4.5	1900	3.75	865	3.55	650	3.45	550	3.2	330	3.1	260	3.3	410	5.2	3200	4.2	1440
21, ...	8.3	12800	5.4	3690	5.0	2860	4.3	1590	3.65	755	3.6	700	3.35	455	3.2	330	3.0	200	3.3	410	4.8	2420	4.0	1170
22, ...	7.9	11200	5.6	4140	4.8	2490	4.25	1520	3.55	650	3.55	650	3.3	410	3.1	260	3.1	260	3.35	455	4.65	2160	4.1	1300
23, ...	7.1	8400	5.6	4140	6.2	5630	4.2	1440	3.65	755	3.35	455	3.3	410	3.1	260	3.1	260	3.3	410	4.55	1980	4.1	1300
24, ...	8.2	12400	5.2	3260	8.8	15000	4.2	1440	3.65	755	3.45	550	3.3	410	3.0	200	3.0	200	3.5	600	4.65	2160	4.1	1300
25, ...	7.6	10200	5.0	2860	10.8	25100	4.5	1900	3.55	650	3.45	550	3.2	330	3.05	230	3.0	200	3.55	650	4.5	1900	4.25	1520
26, ...	7.2	8750	5.4	3690	12.7	36000	6.6	6780	3.6	700	3.35	455	3.3	410	3.0	200	2.95	175	3.45	550	4.5	1900	4.3	1590
27, ...	6.6	6780	4.2	1570	12.6	35400	6.8	7390	4.0	1170	3.35	455	3.25	370	3.0	200	2.95	175	3.55	650	4.4	1740	4.0	1170
28, ...	6.0	5100	5.0	2860	12.2	33000	9.6	18800	6.7	7080	3.45	550	3.25	370	3.0	200	3.0	200	3.55	650	4.25	1520	3.9	1040
29, ...	5.6	4140	....	......	11.0	26200	10.2	21800	6.8	7390	3.2	330	3.2	330	3.1	260	3.0	200	3.45	550	4.25	1520	3.95	1100
30, ...	5.2	3260	....	......	9.6	18800	9.0	15900	6.5	6480	3.0	200	3.35	455	3.1	260	3.0	200	3.5	600	4.35	1660	3.9	1040
31, ...	5.2	3260	....	......	8.7	14600	......	......	4.85	2520	....	......	3.25	370	3.0	200	....	......	3.5	600	....	......	3.8	920

ESTIMATED MONTHLY DISCHARGE OF ALLEGHENY RIVER, AT RED HOUSE, N. Y.

(Drainage area 1640 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	22400	2160	10200	6.22	7.17
February,	4140	884	2000	1.22	1.27
March,	36000	2160	9570	5.84	6.73
April,	21800	1440	5420	3.30	3.68
May,	10800	650	3050	1.86	2.14
June,	2070	200	922	.562	.63
July,	755	330	450	.274	.32
August,	455	200	278	.170	.20
September,	370	175	237	.145	.16
October,	650	330	505	.308	.36
November,	6780	550	2990	1.82	2.03
December,	1660	920	1310	.799	.92
The year,	36000	175	3100	1.89	25.61

KINZUA CREEK.

DESCRIPTION OF BASIN.

Kinzua creek, a tributary of the Allegheny river in Warren county, drains an area of approximately one hundred and eighty square miles. Rising in the center of McKean county, it follows a general westerly direction through a rough, sparsely settled area, covered partly with second growth timber with very little farming being carried on along its course, to its mouth at Kinzua, Warren county, a distance of about 35 miles. The slope is steep and in general the stream flows in a deep, narrow valley between high mountain ridges. Of the many tributaries, the principal one is the South Branch. The headwaters of one of its tributaries are used for a water supply. The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since October 23, 1909, at Dewdrop, approximately three miles above the mouth.

OHIO BASIN—STATION NO. 2.

KINZUA CREEK AT DEWDROP, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, at Dewdrop, Warren county, three miles above the mouth.

RECORDS AVAILABLE—Discharge complete from October 23, 1909, to November 20, 1911, and July 22, 1912 to December 31, 1913.

DRAINAGE AREA—171 square miles.

GAGE—A standard chain gage is fastened to the downstream side of the bridge, near the left bank. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 13.00 feet. Bench Mark No. 1 is outer downstream corner of coping on left abutment; elevation 10.95 feet above gage datum. Bench Mark No. 2 is a square cut in stone on top of downstream end of right bridge seat, elevation 10.92 feet above gage datum. The gage is read once daily, except Sundays, by C. R. Morrison.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is the top edge of the left bridge seat.

CHANNEL—The channel above and below the station is straight for 300 feet and 600 feet respectively. Both banks are low and overflow during extreme high stages. The bed is composed of rocks and gravel, and is fairly regular. There is a good velocity under the bridge at all stages.

DISCHARGE TABLE FOR KINZUA CREEK, AT DEWDROP, WARREN COUNTY, FROM JULY 22, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.00	5	.70	210	.40	904	.10	2084	.80	3629
.10	9	.80	238	.50	959	.20	2169	.90	3724
.20	13	.90	270	.60	1014	.30	2254	7.00	3819
.30	18	2.00	302	.70	1069	.40	2339	.10	3914
.40	24	.10	334	.80	1129	.50	2429	.20	4009
.50	30	.20	370	.90	1189	.60	2519	.30	4104
.60	38	.30	408	4.00	1254	.70	2609	.40	4199
.70	46	.40	446	.10	1319	.80	2699	.50	4299
.80	56	.50	488	.20	1384	.90	2789	.60	4399
.90	66	.60	530	.30	1454	6.00	2879	.70	4499
1.00	78	.70	572	.40	1524	.10	2969	.80	4604
.10	92	.80	618	.50	1599	.20	3059	.90	4714
.20	108	.90	664	.60	1674	.30	3154	8.00	4824
.30	126	3.00	710	.70	1754	.40	3249		
.40	144	.10	756	.80	1834	.50	3344		
.50	164	.20	804	.90	1914	.60	3439		
.60	186	.30	854	5.00	1999	.70	3534		

Note.—This table is only applicable subsequent to July 22, 1912, and is based on 4 discharge measurements made during 1911-12-13, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF KINZUA CREEK, AT DEWDROP, WARREN COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	......	....	2.45	467	3.90	1190	3.40	904	3.20	804	†2.10	334	1.10	92	0.99	77	†0.85	61	1.39	142	1.49	162	1.88	264
2,	2.05	318	†2.38	438	†3.70	1070	3.00	710	2.90	664	2.10	334	1.10	92	0.98	76	0.79	55	1.59	184	†1.45	154	1.87	260
3,	2.90	664	2.30	408	3.50	959	2.90	664	2.65	551	1.90	270	1.10	92	†1.01	79	0.74	50	1.49	162	1.41	146	1.78	232
4,	2.60	530	2.20	370	3.40	904	3.10	756	†2.48	480	1.65	198	†1.10	92	1.04	84	0.69	45	1.39	142	1.40	144	1.68	205
5,	†2.55	509	1.90	270	3.15	780	2.90	664	2.30	408	1.54	173	1.09	91	0.89	65	0.74	50	†1.14	98	1.39	142	1.73	218
6,	2.50	488	1.80	238	3.00	710	*3.20	804	2.20	370	1.50	164	*2.00	302	0.97	74	0.69	45	0.89	65	1.39	142	1.74	221
7,	4.44	1550	**3.5	140	2.50	488	2.60	530	2.00	302	1.60	186	1.30	126	0.97	74	†0.69	45	0.89	65	1.38	140	†1.76	227
8,	8.50	5340	3.0	140	2.80	618	2.60	530	1.95	286	†1.57	179	1.10	92	0.88	64	0.69	45	0.89	65	1.38	140	1.78	232
9,	5.80	2700	†3.0	140	†3.32	864	2.50	488	1.90	270	1.54	173	1.05	85	1.39	142	0.69	45	0.84	60	*2.99	705	1.88	264
10,	4.50	1600	3.0	140	3.85	1160	2.40	446	1.70	210	1.50	164	2.20	370	†1.14	98	0.69	45	0.79	55	2.99	705	1.98	296
11,	4.70	1750	3.5	140	3.00	710	2.70	572	†1.70	210	1.40	144	1.60	186	0.89	65	0.69	45	0.77	53	2.59	526	1.88	264
12,	*5.00	2000	3.0	140	2.80	618	2.50	488	1.70	210	1.30	126	1.40	144	0.79	55	0.69	45	*1.39	142	2.49	484	1.78	232
13,	4.20	1380	3.2	140	2.80	618	†2.48	480	1.60	186	1.25	117	*3.00	710	0.79	55	0.69	45	1.39	142	3.09	751	1.78	232
14,	3.80	1130	3.0	140	3.35	879	2.47	475	1.60	186	1.20	108	2.30	408	0.78	54	†0.67	44	1.09	91	3.59	1010	†1.78	232
15,	3.40	904	3.0	140	3.30	854	2.35	427	1.60	186	†1.30	126	1.67	203	0.78	54	0.64	41	0.89	65	3.39	899	1.78	232
16,	3.25	829	†2.5	140	*3.30	854	2.30	408	1.55	175	1.40	144	1.50	164	0.78	54	0.69	45	0.89	65	†3.07	742	1.68	205
17,	3.05	733	2.0	140	2.80	618	2.10	334	1.51	166	1.30	126	1.40	144	†0.76	52	0.74	50	0.84	60	2.74	590	1.67	203
18,	4.50	1600	2.0	140	2.60	530	2.05	318	†1.46	156	1.20	108	1.32	130	0.74	50	0.99	77	0.79	55	2.69	568	1.65	198
19,	†4.12	1330	2.0	140	2.50	488	2.00	302	1.40	144	1.20	108	1.30	126	0.89	65	0.84	60	*0.99	77	2.49	484	1.63	193
20,	3.75	1100	2.2	140	2.40	446	†1.90	270	1.40	144	1.45	154	*1.90	270	0.84	60	0.79	55	1.74	221	2.44	463	1.38	140
21,	4.55	1640	2.0	140	2.40	446	1.80	238	1.30	126	1.70	210	1.50	164	0.79	55	†0.98	76	1.69	208	2.39	442	†1.43	150
22,	3.80	1130	*4.60	1670	2.30	408	1.80	238	1.40	144	†1.45	154	1.25	117	0.89	65	1.17	103	1.49	162	2.39	442	1.48	160
23,	4.20	1380	†3.80	1130	*3.40	904	1.75	224	1.65	198	1.20	108	1.30	126	1.89	267	0.99	77	1.44	152	†2.29	404	1.73	218
24,	4.68	1740	3.00	710	3.40	904	1.55	175	1.60	186	1.10	92	1.55	175	†1.69	208	0.89	65	2.99	705	2.19	366	1.80	238
25,	4.00	1250	2.70	572	7.00	3820	1.51	166	†1.50	164	1.15	100	1.40	144	1.49	162	0.79	55	2.89	659	2.04	315	1.78	232
26,	†3.68	1060	2.80	618	7.65	4450	1.20	108	1.40	144	1.30	126	1.30	126	0.99	77	0.74	50	†2.49	484	1.99	299	1.63	193
27,	3.35	879	3.10	756	8.00	4820	*2.00	302	1.60	186	1.50	164	†1.25	117	0.89	65	0.73	49	2.09	331	†1.94	283	1.38	140
28,	2.65	551	4.40	1520	6.90	3720	4.55	1640	3.90	1190	1.50	164	1.20	108	0.79	55	†0.72	48	1.89	267	1.89	267	†1.46	156
29,	2.58	522	......	....	4.61	1680	4.00	1250	2.50	488	†1.35	135	1.40	144	0.79	55	0.71	47	1.79	235	1.99	299	1.53	171
30,	2.50	488	......	....	†4.26	1430	3.80	1130	†2.30	408	1.20	108	1.30	126	0.99	77	0.69	45	1.69	208	*2.69	568	1.68	205
31,	2.50	488	......	....	3.91	1200	......	....	2.11	338	......	....	1.15	100	†0.92	68	......	....	1.59	184	......	....	1.60	186

Note.—†Interpolated. *Estimated. **Creek frozen Feb. 7-21 inclusive and discharge estimated from Brokenstraw Creek at Youngsville.

ESTIMATED MONTHLY DISCHARGE OF KINZUA CREEK, AT DEWDROP, WARREN COUNTY, PA.

(Drainage area 171 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	5340	318	1210	7.076	8.158
February,	....	....	402	2.351	2.448
March,	4820	408	1260	7.368	8.495
April,	1640	108	535	3.129	3.491
May,	1190	126	312	1.825	2.104
June,	334	92	160	0.936	1.045
July,	710	85	173	1.012	1.166
August,	267	50	82	0.480	0.553
September,	103	41	54	0.316	0.353
October,	705	53	181	1.058	1.220
November,	1010	140	426	2.491	2.779
December,	296	140	213	1.246	1.437
The year,	5340	41	417	2.441	33.249

CONEWANGO CREEK.

DESCRIPTION OF BASIN.

Conewago creek is one of the largest tributaries of the Allegheny river, draining a total area of approximately 825 square miles, 688 of which lie in New York State. Rising in the western part of Callaiagus county, N. Y., it flows southwardly across the New York-Pennsylvania State line, in Warren county, about 10 miles west of where the Allegheny river crosses. Its source and all of its basin lie in the once glaciated region, abounding in lakes, ponds and marshes, the country being rolling and largely deforested, under cultivation and well inhabited. The valleys are broad and flat. The Chautauqua Lake in New York, lies on a tributary of Cassadoga creek, and below its junction the valley is particularly flat, and the stream sluggish.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since October, 1909, at Frewsburg, New York.

OHIO BASIN—STATION NO. 3.

CONEWANGO CREEK AT FREWSBURG, N. Y.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, known as Whitmans Bridge, one mile above Frewsburg, N. Y.

RECORDS AVAILABLE—Discharge measurements and gage heights from October 25, 1909, to December 31, 1913.

DRAINAGE AREA—690 square miles.

GAGE—A standard chain gage is fastened to the ties of the New York Central Railroad bridge near the left abutment, about 75 feet upstream from highway bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 22.67 feet. Bench Mark No. 1 is outer downstream corner of coping stone of left abutment, downstream wingwall, elevation 19.87 feet above gage datum. The gage is read once daily by Freeland Hobart.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the highway bridge, and at railroad bridge during extreme floods, as the water passes around both sides of the highway bridge. The initial point for soundings is center handrail post, left end of bridge looking downstream.

CHANNEL—The channel above the station is straight for 75 feet to the railroad bridge, then makes a bend to the left. The channel below the station is straight for 600 feet. The right bank is a wide, low meadow, and both banks overflow during high stages. The bed is composed of clay and gravel.

DAILY MEAN GAGE HEIGHTS OF CONEWANGO CREEK, AT FREWSBURG, NEW YORK.

1913.	JAN.	FEB.	MARCH.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	6.20	5.47	5.95	12.05	7.84	2.75	1.38	1.24	0.83	0.70	2.11	2.69
2,	5.90	5.17	5.35	10.55	5.57	2.79	1.31	1.89	0.73	0.75	2.01	2.49
3,	6.70	5.37	4.95	8.42	4.26	3.02	1.21	1.84	0.63	0.92	2.41	2.26
4,	5.50	5.27	4.85	7.60	3.71	2.77	1.18	0.94	0.58	1.12	2.40	2.09
5,	5.50	5.51	4.45	6.98	3.34	2.55	1.46	0.94	0.93	1.02	2.31	2.09
6,	6.62	†5.31	4.15	6.50	3.11	2.22	1.86	0.94	0.98	0.97	2.21	2.20
7,	10.29	†5.11	3.75	6.20	2.97	2.19	1.66	0.94	0.95	1.12	2.11	*2.25
8,	12.65	4.92	3.55	5.95	2.77	2.72	1.46	0.92	0.93	1.12	1.84	2.60
9,	13.50	4.87	3.75	5.65	2.71	2.62	1.26	0.87	0.91	1.02	1.76	2.66
10,	13.20	4.67	8.75	5.28	2.64	2.27	1.18	0.94	0.83	0.97	6.11	2.69
11,	12.90	4.37	10.85	6.45	2.49	2.01	1.16	1.09	0.76	0.92	5.86	2.57
12,	13.10	4.37	12.15	6.32	2.44	1.87	1.01	1.04	0.68	0.97	4.67	2.68
13,	13.20	**4.17	11.95	6.00	2.29	1.72	1.01	0.92	0.63	1.04	5.15	2.69
14,	12.85	**4.12	11.35	5.55	2.39	1.62	0.96	0.82	0.71	1.17	8.60	2.80
15,	12.00	**3.87	10.75	4.85	2.04	1.57	1.17	0.77	0.65	1.15	8.39	3.38
16,	10.90	**3.82	10.55	4.58	1.94	1.57	1.26	0.74	0.61	1.05	7.56	3.14
17,	10.90	**3.67	9.65	4.32	1.94	1.52	1.26	0.64	0.58	0.92	6.91	2.91
18,	12.00	**3.37	7.80	4.05	1.94	1.47	1.26	0.71	0.61	1.02	5.91	2.89
19,	13.80	3.07	6.15	3.80	1.84	1.42	1.11	0.73	0.66	1.12	4.31	2.79
20,	13.70	3.82	4.80	3.80	1.84	1.38	1.16	0.64	0.71	1.12	4.21	2.58
21,	13.40	5.62	5.15	3.45	1.81	1.75	1.16	0.59	0.81	1.58	4.11	2.89
22,	13.35	5.87	6.25	3.20	3.00	1.67	1.11	0.64	0.83	1.95	3.81	3.09
23,	12.80	7.87	6.63	3.15	3.49	1.47	1.01	0.74	0.83	3.87	3.52	2.99
24,	12.65	8.37	7.75	3.55	2.91	1.37	1.01	0.84	0.83	4.27	2.91	2.89
25,	12.30	6.87	11.85	3.15	2.49	1.39	1.01	0.99	0.76	4.72	3.21	2.79
26,	11.80	6.07	15.00	3.10	2.09	1.75	0.96	0.99	0.73	5.14	3.22	2.54
27,	11.35	4.82	15.60	4.60	2.09	2.72	0.96	0.92	0.71	4.72	3.71	2.74
28,	10.41	6.37	15.35	8.02	5.40	2.27	0.96	0.89	0.73	3.57	3.41	2.74
29,	6.35	....	14.43	9.72	7.04	1.72	1.04	0.92	0.76	2.58	2.71	2.74
30,	6.15	....	13.73	9.75	6.19	1.46	0.96	0.89	0.73	2.32	2.57	2.64
31,	5.85	....	13.05	....	4.09	....	1.11	0.79	....	2.22	....	2.54

Notes.—*Estimated. †Interpolated. **Gage height to top of ice.

BROKENSTRAW CREEK.

DESCRIPTION OF BASIN.

Brokenstraw creek, a tributary of the Allegheny river, drains an area of approximately 324 square miles, 70 of which lie in New York State. Rising in Chautauqua county, New York, about five miles north of the Pennsylvania State line, it flows in a general southerly direction and enters Erie county, Pa., near its northeastern corner, and turning southeasterly passes into and through Warren county to its mouth at Irvineton, a distance of about 35 miles. This stream flows through a rolling, agricultural country, bordered by a wide valley, sparsely settled and considerably deforested. A few boroughs lie in the basin, and some farming villages. The flow of this stream is not rapid, the source lying at an elevation of 1,720 feet, and the mouth at 1,140 feet, the average slope per mile being 10 feet from the New York State line through Pennsylvania to its mouth. The upper watershed lies within the glacial area. There are many tributaries, Little Brokenstraw being the largest, and on the headwaters there are a few lakes, ponds and swamps. It is not used for water supply and very little power has been developed.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge of this creek has been measured since October 22, 1909, at Youngsville, Warren county, approximately 3 miles above its mouth.

OHIO BASIN—STATION NO. 4.

BROKENSTRAW CREEK AT YOUNGSVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway and trolley bridge, at Youngsville, Warren county, Pa., about three miles above the mouth of the creek.

RECORDS AVAILABLE—Discharge complete from October 22, 1909, to December 31, 1913.

DRAINAGE AREA—290 square miles.

GAGE—A 14-foot staff gage is spiked to the face of the right abutment. The elevation of zero is arbitrary. Bench Mark No. 1

is ring cut in stone on top of upstream corner of right abutment on the outer edge near the date 1891 cut in stone; elevation 12.42 feet of gage datum. Gage is read twice daily by W. F. Schnell.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge; low water measurements by wading. The initial point for soundings is the top edge of the bridge seat, right abutment.

CHANNEL—The channel above the station curves gradually to the right (looking upstream) with a riffle 300 feet above the bridge. The channel below the station is straight for 1,000 feet. The right bank is high and not subject to overflow. The left bank overflows for a short distance under approach trestle at extreme high stages. The bed is composed of clay and gravel. The section is deep and the velocity sluggish.

REMARKS—At approximately 10.0 ft. gage height water leaves the regular creek channel about ¼ mile above the gaging station and discharges through a flood channel to the west. Since the quantity of water flowing in the flood channel is unknown at the present time, discharges above gage height 10.0 ft. have not been published.

DISCHARGE TABLE FOR BROKENSTRAW CREEK, AT YOUNGSVILLE, WARREN COUNTY, FROM JAN. 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.00	50	.90	592	.80	2035	.70	4175	.60	7300
.10	60	2.00	650	.90	2130	.80	4315	.70	7475
.20	71	.10	710	4.00	2225	.90	4460	.80	7650
.30	83	.20	775	.10	2325	6.00	4610	.90	7825
.40	97	.30	840	.20	2425	.10	4765	8.00	8000
.50	113	.40	905	.30	2525	.20	4925	.10	8175
.60	131	.50	975	.40	2630	.30	5090	.20	8350
.70	151	.60	1045	.50	2735	.40	5260	.30	8525
.80	173	.70	1120	.60	2840	.50	5430	.40	8700
.90	197	.80	1195	.70	2950	.60	5600	.50	8875
1.00	223	.90	1270	.80	3060	.70	5770	.60	9050
.10	251	3.00	1350	.90	3175	.80	5940	.70	9225
.20	282	.10	1430	5.00	3290	.90	6110	.80	9400
.30	316	.20	1510	.10	3405	7.00	6280	.90	9575
.40	353	.30	1595	.20	3525	.10	6450	9.00	9750
.50	393	.40	1680	.30	3650	.20	6620		
.60	437	.50	1765	.40	3775	.30	6790		
.70	485	.60	1855	.50	3905	.40	6960		
.80	537	.70	1945	.60	4040	.50	7130		

Note.—This table is only applicable subsequent to Jan. 1, 1913, and is based on 2 discharge measurements made in 1913, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BROKENSTRAW CREEK, AT YOUNGSVILLE, WARREN COUNTY, PENNA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	2.95	1310	1.90	592	2.75	1160	2.40	905	1.75	511	0.85	185	0.20	71	—0.05	45	—0.15	38	0.75	162	1.00	223	0.75	162
2,	2.60	1040	1.60	437	2.00	650	1.90	592	1.55	415	0.55	122	0.15	66	—0.10	40	—0.15	38	0.80	173	1.00	223	0.70	151
3,	3.00	1350	1.50	393	1.95	621	2.25	808	1.20	282	0.45	105	0.10	60	—0.15	38	—0.20	35	0.90	197	0.85	185	0.60	131
4,	3.50	1760	1.45	373	2.00	650	2.00	650	0.85	185	0.40	97	0.10	60	—0.20	35	—0.20	35	0.55	122	0.80	173	0.55	122
5,	2.30	840	1.40	353	1.85	564	2.10	710	0.65	141	0.40	97	0.10	60	—0.20	35	—0.10	40	0.60	131	0.80	173	0.50	113
6,	3.30	1600	1.40	353	1.80	537	1.75	511	0.50	113	0.35	90	0.60	131	—0.15	38	—0.15	38	0.15	66	0.75	162	0.50	113
7,	5.80	4320	1.40	353	1.80	537	1.70	485	0.45	105	0.30	83	0.50	113	—0.10	40	—0.20	35	0.00	50	0.70	151	0.65	141
8,	8.97	9700	1.40	353	1.70	485	1.55	415	0.45	105	0.30	83	0.40	97	—0.10	40	—0.20	35	0.00	50	0.75	162	1.00	223
9,	7.00	6280	1.40	353	1.70	485	1.40	353	0.40	97	0.30	83	0.45	105	—0.10	40	—0.20	35	—0.10	40	2.60	1040	0.90	197
10,	4.45	2680	1.25	299	2.50	975	1.40	353	0.40	97	0.30	83	0.55	122	—0.10	40	—0.20	35	—0.10	40	4.10	2320	0.90	197
11,	4.00	2220	1.10	251	4.20	2420	2.00	650	0.40	97	0.25	77	0.40	97	—0.15	38	—0.20	35	—0.05	45	3.40	1680	0.85	185
12,	6.00	4610	1.00	223	4.30	2520	1.75	511	0.40	97	0.20	71	0.40	97	—0.20	35	—0.20	35	0.75	162	2.80	1200	0.80	173
13,	5.25	3590	1.00	223	4.20	2420	1.65	461	0.40	97	0.20	71	1.55	415	—0.20	35	—0.20	35	0.50	113	3.30	1600	0.80	173
14,	3.80	2040	1.00	223	4.20	2420	1.50	393	0.40	97	0.20	71	2.70	1120	—0.20	35	—0.20	35	0.45	105	5.10	3400	1.00	223
15,	2.60	1040	1.00	223	4.20	2420	1.25	299	0.40	97	0.20	71	1.60	437	—0.20	35	—0.20	35	0.20	71	3.60	1860	1.20	282
16,	2.70	1120	1.00	223	3.40	1680	1.80	537	0.40	97	0.40	97	0.95	210	—0.20	35	—0.20	35	0.10	60	3.00	1350	1.10	251
17,	5.20	3520	1.00	223	2.50	975	1.55	415	0.40	97	0.30	83	0.70	151	—0.20	35	—0.10	40	0.00	50	2.40	905	1.00	223
18,	6.45	5340	1.00	223	2.10	710	1.50	393	0.40	97	0.30	83	0.25	77	—0.20	35	0.00	50	0.15	66	1.70	485	0.90	197
19,	6.85	6020	1.00	223	1.75	511	1.40	353	0.40	97	0.35	90	0.20	71	—0.20	35	—0.10	40	0.25	77	1.50	393	0.80	173
20,	4.85	3120	1.20	282	1.60	437	1.30	316	0.35	90	0.40	97	0.15	66	—0.20	35	—0.20	35	0.40	97	1.40	353	0.60	131
21,	5.00	3290	2.25	808	1.60	437	0.95	210	0.35	90	0.45	105	0.10	60	—0.20	35	+0.10	60	1.40	353	1.40	353	0.60	131
22,	4.40	2630	3.40	1680	1.50	393	0.65	141	0.30	83	0.40	97	0.10	60	—0.10	40	0.00	50	1.70	485	1.35	334	0.70	151
23,	4.10	2320	3.90	2130	1.40	353	0.50	113	0.30	83	0.35	90	0.10	60	+0.10	60	—0.10	40	1.85	564	1.30	316	0.85	185
24,	4.90	3180	3.20	1510	5.05	3350	0.50	113	0.30	83	0.35	90	0.10	60	+0.05	55	—0.10	40	2.45	940	1.10	251	0.90	197
25,	4.40	2630	2.30	840	a11.5	......	0.50	113	0.30	83	0.30	83	0.10	60	0.00	50	—0.15	38	3.60	1860	1.00	223	1.00	223
26,	3.80	2040	2.10	710	9.70	*11000	0.50	113	0.30	83	0.30	83	0.10	60	0.00	50	—0.20	35	3.65	1900	0.95	210	1.00	223
27,	2.40	905	1.90	592	8.70	9220	1.10	251	0.60	131	0.25	77	0.10	60	—0.10	40	—0.20	35	2.80	1200	0.90	197	0.90	197
28,	2.10	710	3.20	1510	6.43	5310	1.90	592	2.60	1040	0.40	97	0.10	60	—0.20	35	—0.20	35	1.80	537	0.80	173	0.80	173
29,	1.85	564	....	......	4.20	2420	3.30	1600	2.00	650	0.35	90	0.05	55	0.00	50	—0.20	35	1.20	282	0.70	151	0.60	131
30,	1.70	485	....	......	2.90	1270	2.40	905	1.65	461	0.30	83	0.05	55	—0.05	45	—0.15	38	1.10	251	0.80	173	0.60	131
31,	1.80	537	....	......	2.60	1040	....	......	1.15	266	....	......	0.00	50	—0.10	40	......	....	1.10	251	......	....	0.60	131

Note.—a=Max. 12.2′† at 5:00 P. M. *Estimated. †See "Remarks—Description of Station."

ESTMATED MONTHLY DISCHARGE OF BROKENSTRAW CREEK, AT YOUNGSVILLE, WARREN COUNTY, PA.

(Drainage area 290 square miles.)

Month.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	9700	485	2670	9.207	10.615
February,	2130	223	570	1.966	2.047
March,	....	353	2320	8.000	9.223
April,	1600	113	475	1.638	1.828
May,	1040	83	196	0.676	0.779
June,	185	71	91	0.314	0.350
July,	1120	50	138	0.476	0.549
August,	60	35	40	0.138	0.159
September,	60	35	38	0.131	0.146
October,	1900	40	339	1.169	1.348
November,	3400	151	681	2.348	2.620
December,	282	113	175	0.603	0.695
The year,	....	35	644	2.222	30.359

TIONESTA CREEK.

DESCRIPTION OF BASIN.

Tionesta creek, one of the large tributaries of the Allegheny river, drains approximately 485 square miles in Warren, McKean and Forest counties. The main stream rises on the west slope of the Allegheny mountains in the southcentral part of Warren county, and flows in a northeasterly direction for approximately 13 miles to Clarendon, Warren county, where it turns and flows in a general southerly direction for approximately 13 miles to the Warren-Forest county line, thence flowing in a general southwesterly direction for approximately 32 miles to its mouth in the Allegheny river at Tionesta, Forest county, a total distance of approximately 58 miles.

The valley of the stream near its headwaters is fairly broad, the creek flowing through low, marshy land, but after it leaves Sheffield, it enters a gorge-like valley, with hills rising 500 feet to 600 feet on either side, to its mouth. The valleys in the lower reaches are farmed to a small extent, while on the adjoining hills is some virgin and second-growth timber. A large portion of the high ground is under cultivation.

There is considerable lumbering carried on in its drainage basin, and there are several saw mills along the course of the stream and its tributaries. There are also several small water power installations along this stream, some of which, however, have been abandoned.

The elevation of the creek at Saybrook, at the mouth of Four-Mile run, 18 miles below its source, is 1,348 feet above mean sea level, while at its mouth at Tionesta it is 1,044 feet above mean sea level, a fall of 304 feet in a distance of approximately 40 miles, or at the rate of 7½ feet per mile.

There are no large streams entering the creek, although there are numerous small tributaries from the east and west. Several of the tributaries above Sheffield and Clarendon come from wooded hills, and are clear and pure.

The largest communities in its watershed are Nebraska, Sheffield, Clarendon, none of which, however, are of any considerable size.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since July 26th, 1912, at Butler Bridge, about 2 miles above Nebraska, Forest county, Penn'a.

OHIO BASIN—STATION NO. 5.

TIONESTA CREEK AT BUTLER BRIDGE, PA.

DESCRIPTION OF STATION

LOCATION—On three span bridge; 2 deck spans and one through-truss steel span, about 2 miles above Nebraska, Forest county.

RECORDS AVAILABLE—Discharge measurements and gage heights from July 26, 1912 to December 31, 1913.

DRAINAGE AREA—420 square miles.

GAGE—A sectional chain gage is fastened to the face of the wooden guard-rail. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 32.83 feet. Bench Mark No. 1 is a cross chiseled on the downstream side of the right pier, marked "B. M. W. S. C. of PA."; elevation 17.77 feet above gage datum. The gage is read once daily by Mrs. P. S. Moore.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is right end of downstream handrail.

CHANNEL—The channel above and below the station is straight for 200 feet and 1,500 feet respectively. Both banks are high and not subject to overflow. The bed is composed of gravel and boulders.

DAILY MEAN GAGE HEIGHTS OF TIONESTA CREEK, AT BUTLER BRIDGE, FOREST COUNTY, PA.

1913.	JAN.	FEB.	MAR.	APR.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	6.90	*5.00	7.80	5.70	5.10	4.85	3.65	3.60	3.44	3.53	4.22	4.31
2,	6.50	*7.25	7.60	5.40	4.90	5.30	3.65	3.70	3.34	3.63	4.12	4.31
3,	6.30	*8.50	6.90	5.30	4.80	4.75	3.65	3.50	3.34	4.13	4.02	4.31
4,	7.10	*9.10	7.20	5.30	4.70	4.60	3.55	3.60	3.34	3.83	4.02	4.31
5,	6.60	*8.30	6.80	5.50	4.40	4.35	4.00	3.40	3.34	3.63	4.02	4.31
6,	6.50	*8.30	6.50	5.20	4.30	4.25	5.15	3.50	3.24	3.53	3.92	4.21
7,	7.00	*8.30	5.80	5.00	4.30	4.30	4.45	3.30	3.24	3.43	3.92	4.21
8,	11.60	7.60	6.20	4.90	4.20	4.25	3.95	3.50	3.24	3.13	4.02	4.61
9,	9.80	7.60	6.40	4.80	4.20	4.00	3.95	3.40	3.24	3.43	4.12	4.31
10,	7.50	7.60	6.90	4.60	4.20	3.95	5.60	3.70	3.24	3.33	6.42	4.31
11,	7.20	7.60	6.90	4.90	4.10	3.85	4.95	3.50	3.24	3.33	5.62	4.31
12,	8.30	7.40	7.10	4.90	4.00	3.90	4.45	3.50	3.24	3.63	5.02	4.11
13,	7.40	7.00	5.40	4.80	4.00	3.75	4.25	3.40	3.24	3.93	4.92	4.71
14,	6.60	6.90	5.70	4.90	4.00	3.80	6.75	3.50	3.24	3.93	6.22	4.61
15,	5.90	6.90	5.90	4.80	3.80	3.65	5.60	3.30	3.24	3.83	6.02	4.21
16,	5.80	7.00	5.60	4.80	4.20	3.95	4.85	3.40	3.24	3.63	5.82	4.41
17,	7.00	6.80	5.30	4.70	4.00	3.90	4.55	3.30	3.24	3.53	5.52	4.11
18,	7.60	6.70	5.10	4.60	3.90	3.75	4.45	3.40	3.34	3.63	5.22	4.11
19,	7.00	6.60	4.90	4.50	3.90	3.70	4.25	3.30	3.44	3.63	5.02	4.11
20,	6.50	6.60	4.90	4.30	3.70	4.05	4.20	3.50	3.44	4.03	4.92	3.91
21,	7.50	6.80	4.80	4.30	3.80	4.45	4.15	3.10	3.54	4.23	4.82	4.01
22,	6.80	7.40	4.70	4.30	4.00	4.30	3.95	3.50	3.54	4.23	4.72	4.11
23,	6.30	7.10	4.60	4.20	4.40	3.85	3.85	4.00	3.54	4.13	4.62	4.21
24,	8.10	7.10	6.90	4.20	4.30	3.80	4.15	3.70	3.44	4.23	4.42	4.61
25,	6.90	6.80	10.00	4.10	4.10	3.75	4.10	3.50	3.34	5.83	4.12	5.21
26,	6.40	6.50	11.20	4.10	4.20	4.05	3.85	3.50	3.34	5.83	4.42	5.81
27,	6.00	6.80	11.20	4.50	4.70	4.20	3.75	3.30	3.34	5.13	4.32	5.61
28,	5.60	8.20	9.80	5.60	6.10	3.95	3.75	3.10	3.24	4.83	4.42	5.61
29,	5.30	....	7.50	6.00	6.20	3.90	3.75	3.60	3.24	4.43	4.42	5.11
30,	5.20	....	6.30	5.50	5.40	3.65	3.80	3.50	3.24	4.43	4.42	5.11
31,	†5.10	....	6.10	....	5.10	....	3.75	3.40	....	4.33	....	5.11

Notes.– *Estimated. †Interpolated.

OIL CREEK.

DESCRIPTION OF BASIN.

Oil creek, a tributary of the Allegheny river, drains an approximate area of 335 square miles in Erie, Crawford, Warren and Venango counties. It rises in Oil Creek Lake, Crawford county, which lake is fed by numerous streams and runs heading in Erie county; the East Branch of Oil creek rising in a large lake at Spartansburg, Crawford county is also fed by numerous streams rising in Erie county. These two streams join at Centerville, Crawford county, the creek proper having a fall of 116 feet in a distance of 6 miles, while the East Branch has a fall of 150 feet in eight miles. From the junction of these streams Oil creek flows in a general southerly direction through Crawford and Venango counties to its mouth at Oil City, a distance of 30 miles. From Centerville (elevation 1,275) to Oil City (elevation 985), the slope of the creek is at a uniform rate of 10 feet per mile. There are many tributaries, none, however, of any considerable size. The valley of Oil creek is wide and flat, the hills rising abruptly, and often with cliffs, from its flood plain. Its upper section lies in the glacial area. The valley is underlain with productive oil fields, farming and oil production being carried on throughout the basin. Its valley is largely deforested, and along its course lie numerous large boroughs and villages. The stream is used extensively for industrial water supply but no domestic supplies are obtained from it.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since October 20, 1909, at Rouseville, about two and one-half miles above the mouth.

OHIO BASIN—STATION NO. 6.

OIL CREEK AT ROUSEVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, steel, through-truss, highway bridge, ½ mile below Rouseville, Venango county, and 2½ miles above the mouth.

RECORDS AVAILABLE—Discharge complete from October 20, 1909, to December 31, 1913.

DRAINAGE AREA—330 square miles.

GAGE—A standard chain gage is attached to the lower chord, downstream side, left span. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 16.91 feet. Bench Mark No. 1 is top corner at upstream end of stone in bottom course at downstream corner of right abutment; elevation 1.46 feet above gage datum. Bench Mark No. 2 is bottom of iron bedplate on right abutment, downstream truss; elevation 15.76 feet above gage datum. The gage is read once daily by C. H. Wright.

DISCHARGE MEASUREMENTS—Taken from downstream side of bridge. By wading at extreme low stages. The initial point for soundings is top edge right bridge seat.

CHANNEL—The channel is straight above and below for 200 feet and 1,000 feet respectively. The right bank overflows during extreme high stages. The left bank is high and not subject to overflow. The bed is composed of gravel.

DISCHARGE TABLE FOR OIL CREEK, AT ROUSEVILLE, VENANGO COUNTY, FROM OCT. 20, 1909.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
0.40	33	.60	420	.80	2000	4.00	4080	.20	6580
.50	45	.70	495	.90	2170	.10	4260	.30	6820
.60	60	.80	580	3.00	2340	.20	4450	.40	7080
.70	77	.90	675	.10	2510	.30	4640	.50	7360
.80	96	2.00	780	.20	2680	.40	4840	.60	7640
.90	118	.10	900	.30	2850	.50	5040	.70	7940
1.00	145	.20	1030	.40	3020	.60	5240	.80	8240
.10	175	.30	1170	.50	3195	.70	5460	.90	8540
.20	210	.40	1320	.60	3370	.80	5680	6.00	8840
.30	255	.50	1490	.70	3545	.90	5900		
.40	300	.60	1660	.80	3720	5.00	6120		
.50	355	.70	1830	.90	3900	.10	6340		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF OIL CREEK, AT ROUSEVILLE, VENANGO COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	1.95	728	1.74	529	2.59	1640	2.50	1490	1.55	388	1.40	300	1.10	175	0.90	118	0.80	96	0.80	96	1.70	495	1.60	420
2, ...	1.85	628	1.54	381	2.24	1090	2.20	1030	1.45	328	2.40	1320	1.10	175	0.80	96	0.80	96	1.10	175	1.60	420	1.50	355
3, ...	2.15	965	1.44	322	2.84	2070	2.20	1030	1.40	300	1.70	495	1.00	145	0.80	96	0.70	77	1.20	210	1.50	355	1.40	300
4, ...	2.35	1240	1.44	322	2.84	2070	2.00	780	1.20	210	1.60	420	1.00	145	0.80	96	0.70	77	1.20	210	1.50	355	1.40	300
5, ...	2.05	840	1.34	273	2.74	1900	2.20	1030	1.20	210	1.40	300	2.40	1320	0.80	96	0.70	77	1.10	175	1.50	355	1.50	355
6, ...	2.05	840	1.34	273	2.64	1730	2.00	780	1.20	210	1.40	300	2.90	2170	0.80	96	0.60	60	1.00	145	1.40	300	1.30	255
7, ...	4.00	4080	1.24	228	2.44	1390	1.90	675	1.20	210	1.50	355	2.00	780	0.70	77	0.60	60	0.80	96	1.40	300	1.40	300
8, ...	5.55	7500	1.14	189	1.49	350	1.90	675	1.20	210	1.40	300	1.60	420	0.80	96	0.60	60	0.80	96	1.40	300	1.60	420
9, ...	4.85	5790	1.14	189	1.54	381	1.90	675	1.10	175	1.30	255	1.50	355	0.80	96	0.60	60	0.80	96	1.90	675	1.60	420
10, ...	2.20	1030	1.14	189	2.74	1900	1.80	580	1.20	210	1.10	175	2.00	780	0.90	118	0.70	77	0.80	96	3.20	2680	1.50	355
11, ...	3.40	3020	1.14	189	3.04	2410	2.00	780	1.20	210	1.10	175	1.50	355	0.90	118	0.60	60	0.80	96	2.20	1030	1.40	300
12, ...	4.05	4170	1.04	157	3.91	2240	2.10	900	1.10	175	1.10	175	1.20	210	0.80	96	0.50	45	0.90	118	2.00	780	1.30	255
13, ...	2.95	2260	1.04	157	2.74	1900	2.00	780	1.00	145	1.00	145	1.30	255	0.70	77	0.60	60	1.00	145	2.90	2170	1.30	255
14.	1.70	495	1.04	157	2.74	1900	2.00	780	1.00	145	1.00	145	2.60	1660	0.60	60	0.60	60	1.10	175	4.60	5240	1.40	300
15, ...	2.00	780	1.14	189	2.64	1730	1.90	675	1.10	175	0.90	118	1.60	420	0.60	60	0.50	45	0.90	118	3.00	2340	1.50	355
16, ...	2.15	965	1.14	189	2.54	1560	1.80	580	1.20	210	0.80	96	1.20	210	0.60	60	0.60	60	0.80	96	2.60	1660	1.40	300
17, ...	4.05	4170	1.04	157	2.44	1390	1.80	580	1.10	175	0.90	118	1.20	210	0.60	60	0.70	77	0.80	96	2.20	1030	1.40	300
18, ...	4.15	4360	1.04	157	1.94	717	1.70	495	1.10	175	0.90	118	1.10	175	0.60	60	0.80	96	0.90	118	2.00	780	1.40	300
19, ...	3.85	3810	1.04	157	1.84	618	1.70	495	1.00	145	0.80	96	1.00	145	0.60	60	0.80	96	0.80	96	1.90	675	1.40	300
20.	3.75	3630	1.24	228	1.74	529	1.70	495	1.00	145	1.00	145	1.10	175	0.60	60	0.80	96	1.00	145	2.10	900	1.40	300
21, ...	3.75	3630	1.64	450	1.64	450	1.60	420	0.90	118	1.50	355	1.00	145	0.60	60	0.70	77	1.30	255	1.90	675	1.30	255
22, ...	2.75	1920	1.84	618	1.54	381	1.60	420	1.10	175	1.40	300	1.00	145	0.90	118	0.90	118	1.70	495	1.70	495	1.30	255
23, ...	2.95	2260	2.64	1730	1.51	381	1.50	355	1.10	175	1.30	255	0.90	118	1.50	355	0.80	96	1.80	580	1.70	495	1.30	255
24, ...	3.95	3990	1.94	717	3.69	3530	1.50	355	1.20	210	1.00	145	1.00	145	1.00	145	0.70	77	2.00	780	1.60	420	1.40	300
25.	2.85	2180	1.64	450	6.94	*11900	1.40	300	1.10	175	3.00	2340	1.00	145	0.90	118	0.70	77	2.80	2000	1.50	355	1.50	355
26, ...	2.55	1580	1.24	228	6.64	*10900	1.40	300	1.00	145	2.50	1490	0.90	118	0.80	96	0.70	77	3.00	2340	1.50	355	1.50	355
27, ...	2.35	1240	1.64	450	6.34	*9640	1.40	300	1.10	175	2.80	2000	0.90	118	0.80	96	0.70	77	2.80	2000	1.60	420	1.40	300
28.	2.15	965	3.04	2410	6.00	8840	1.50	355	2.40	1320	2.40	1320	0.90	118	0.70	77	0.60	60	2.00	780	1.50	355	1.40	300
29.	2.05	840	....	......	3.10	2510	1.95	728	1.90	675	2.00	780	0.80	96	0.90	118	0.60	60	2.70	1830	1.60	420	1.30	255
30, ...	1.95	728	....	......	2.80	2000	1.60	420	1.50	355	1.60	420	0.90	118	0.90	118	0.80	96	1.70	495	1.60	420	1.40	300
31, ...	1.85	628	....	......	2.80	2000	....	......	1.40	300	....	......	0.90	118	0.80	96	....	......	1.70	495	......	......	1.30	255

Note.—*Estimated.

ESTIMATED MONTHLY DISCHARGE OF OIL CREEK, AT ROUSEVILLE, VENANGO COUNTY, PA.

(Drainage area 330 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	7500	495	2300	6.970	8.036
February,	2410	157	417	1.264	1.316
March,	*11900	370	2650	8.030	9.258
April,	1490	300	642	1.945	2.170
May,	1320	118	257	0.779	0.898
June,	2340	96	499	1.512	1.687
July,	2170	96	376	1.139	1.313
August,	355	69	100	0.303	0.349
September,	118	45	75	0.227	0.253
October,	2310	96	473	1.433	1.652
November,	5240	300	908	2.752	3.070
December,	420	255	311	0.942	1.086
The year,	*11900	45	751	2.275	31.088

*Estimated.

NORTH BRANCH OF FRENCH CREEK.

DESCRIPTION OF BASIN.

The North Branch of French creek, the largest tributary of French creek, rises in the southwestern corner of New York State, in numerous tributaries, draining an area of approximately 217 square miles, 114 of which lie in New York State, and flows in a general westerly direction into Erie county, Penn'a. and thence continues in a general southerly direction to its junction with the South Branch, at Leboeuf, Erie county, a distance of approximately 30 miles, the entire watershed lying north of the terminal morain.

The headwaters of this stream flow through broad, flat valleys, the side hills being low and rolling and covered with second growth timber. There are a few small lakes and swampy areas at the headwaters, the largest lake being Findley Lake, in New York State, near the New York-Pennsylvania state line. As the stream approaches its confluence with the south branch the hills become higher and the fall greater. Throughout the entire course it flows through a well populated, agricultural region. There are numerous small towns and boroughs in the watershed, the largest of which is Wattburg.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge of the stream has been measured since May 4th, 1910, at Kimmeytown, about six miles above its mouth.

OHIO BASIN—STATION NO. 7.

NORTH BRANCH OF FRENCH CREEK AT KIMMEYTOWN, PA.

DESCRIPTION OF STATION.

LOCATION—On steel highway bridge at Kimmeytown, Erie county, about 5 miles above the mouth of the creek.

RECORDS AVAILABLE—Discharge complete from May 4, 1910, to December 31, 1913.

DRAINAGE AREA—190 square miles.

GAGE—A chain gage is attached to the downstream guardrail of the bridge. The elevation of zero is 1,235.7 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 16.20 feet. Bench Mark No. 1 is on west abutment, downstream side, top of caisson; elevation 1,250.09 feet above mean sea level. The gage is read once daily by Mrs. J. L. Carter.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, or by wading at a section 200 feet above the bridge at extreme low stages. The initial point for soundings is outer face of caisson at left end of bridge.

CHANNEL—The channel above and below the station is straight for 300 feet and 600 feet respectively. The banks are subject to overflow at extreme high stages. The bed is composed of gravel.

DISCHARGE TABLE FOR NORTH BRANCH FRENCH CREEK, AT KIMMEYTOWN, ERIE COUNTY, FROM MAY 16, 1910.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.40	14	.90	344	.40	1010	.90	1920	.40	3140
.50	20	2.00	378	.50	1060	5.00	1990	.50	3230
.60	26	.10	414	.60	1120	.10	2060	.60	3320
.70	32	.20	450	.70	1180	.20	2140	.70	3420
.80	46	.30	490	.80	1240	.30	2220	.80	3520
.90	64	.40	530	.90	1300	.40	2300	.90	3630
1.00	86	.50	572	4.00	1360	.50	2380	7.00	3740
.10	108	.60	616	.10	1420	.60	2460	.10	3850
.20	132	.70	662	.20	1480	.70	2540	.20	3970
.30	160	.80	710	.30	1540	.80	2620	.30	4090
.40	188	.90	760	.40	1600	.90	2700	.40	4210
.50	216	3.00	810	.50	1660	6.00	2780	.50	4340
.60	246	.10	860	.60	1720	.10	2870	.60	4470
.70	276	.20	910	.70	1780	.20	2960	.70	4600
.80	310	.30	960	.80	1850	.30	3050		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF NORTH BRANCH FRENCH CREEK, AT KIMMEYTOWN, ERIE COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	3.40	1010	2.20	450	2.74	681	3.10	860	2.00	378	†1.60	246	0.75	39	0.55	23	0.55	23	0.70	32	2.14	428	1.44	199
2, ...	3.10	860	†2.25	470	*2.24	466	2.50	572	1.60	246	1.70	276	0.70	32	0.60	26	0.55	23	0.70	32	†1.89	341	1.34	171
3, ...	3.40	1010	2.10	414	2.14	428	2.50	572	1.40	188	1.20	132	0.65	29	†0.60	26	0.65	29	0.90	64	1.64	258	1.34	171
4, ...	3.00	810	2.00	378	2.14	428	2.80	710	1.30	160	1.10	108	0.80	46	0.70	32	0.55	23	1.00	86	1.54	228	1.34	171
5, ...	†3.75	1210	2.10	414	1.94	358	2.90	760	†1.20	132	1.00	86	0.85	55	0.55	23	0.60	26	†0.80	46	1.44	199	1.34	171
6, ...	4.70	1780	2.00	378	1.94	358	†2.60	616	1.20	132	0.90	64	†0.85	55	0.65	29	0.55	23	0.80	46	1.44	199	†1.24	143
7, ...	7.40	4210	2.40	530	1.64	258	2.30	490	1.20	132	1.10	108	0.90	64	0.70	32	†0.60	26	0.60	26	1.44	199	*2.04	392
8, ...	9.30	*7080	‡	200	1.84	324	2.30	490	1.20	132	†1.15	120	0.75	39	0.65	29	0.65	29	0.70	32	1.44	199	2.04	392
9, ...	6.00	2780	......	200	*2.94	780	2.10	414	1.10	108	1.20	132	0.70	32	0.80	46	0.65	29	0.60	26	*5.44	2330	2.04	392
10, ...	4.20	1480	......	200	3.14	880	1.90	344	1.00	86	0.90	64	0.85	55	0.75	39	0.60	26	0.70	32	4.84	1880	1.94	358
11, ...	4.50	1660	......	200	4.84	1880	2.90	760	†1.05	97	0.90	64	0.75	39	0.75	39	0.55	23	0.60	26	3.74	1200	1.84	324
12, ...	8.20	*5280	......	200	4.44	1620	3.00	810	1.00	86	0.90	64	0.80	46	†0.75	39	0.55	23	†0.85	55	3.14	880	1.84	324
13, ...	5.20	2140	......	200	5.04	2020	†2.55	594	0.90	64	0.80	46	†0.75	39	0.65	29	0.55	23	0.90	64	4.99	1980	1.74	290
14, ...	3.80	1240	......	200	5.34	2250	2.10	414	1.00	86	0.80	46	†0.80	46	0.70	32	†0.55	23	1.00	86	8.24	*5360	†1.94	358
15, ...	3.00	810	.....	200	4.54	1680	1.90	344	1.00	86	†0.90	64	†0.75	39	0.65	29	0.60	26	0.80	46	5.24	2170	2.14	428
16, ...	3.30	960	......	200	*2.94	780	1.70	276	*1.80	310	1.00	86	†0.75	39	0.65	29	0.55	23	0.90	64	†4.19	1470	1.94	358
17, ...	5.70	2540	......	200	2.74	681	1.60	246	†1.53	225	0.80	46	0.80	46	†0.65	29	0.45	17	0.70	32	3.14	880	1.84	324
18, ...	a8.65	*5980	......	200	2.34	506	1.50	216	†1.26	149	0.80	46	0.75	39	0.55	23	0.65	29	0.90	64	2.64	634	1.84	324
19, ...	8.20	*5280	......	200	2.64	634	1.40	188	1.00	86	0.70	32	0.70	32	0.70	32	0.65	29	†0.80	46	2.54	590	1.74	290
20, ...	4.30	1540	......	200	2.34	506	†1.35	174	0.90	64	0.60	26	†0.65	29	0.55	23	0.60	26	0.90	64	2.84	730	1.54	228
21, ...	5.70	2540	......	500	2.14	428	1.30	160	1.00	86	1.00	86	0.65	29	0.55	23	*0.95	75	1.20	132	2.84	730	†1.54	228
22, ...	4.30	1540	......	1000	2.04	392	1.20	132	1.00	86	†1.00	86	0.60	26	0.70	32	0.55	23	2.00	378	2.44	547	1.54	228
23, ...	†5.00	1990	†3.70	1180	*4.94	1950	1.30	160	1.70	276	1.00	86	0.55	23	0.75	39	0.55	23	2.10	414	†2.24	466	1.34	171
24, ...	5.90	2700	3.50	1060	6.24	3000	1.30	160	1.40	188	0.90	64	0.70	32	*1.40	188	0.55	23	3.00	810	2.04	392	2.14	428
25, ...	4.30	1540	2.50	572	b12.14	*12000	1.30	160	†1.25	146	0.80	46	0.65	29	0.65	29	0.70	32	4.60	1720	1.84	324	1.94	358
26, ...	†3.65	1150	2.30	490	10.24	*8720	1.30	160	1.10	108	0.90	64	0.65	29	0.65	29	0.55	23	*4.30	1540	1.74	290	†1.84	324
27, ...	2.80	710	2.40	530	8.94	*6460	*2.00	378	1.00	86	0.90	64	*1.00	86	0.70	32	0.55	23	3.10	910	1.64	258	1.74	290
28, ...	2.50	572	3.10	860	6.34	3090	2.10	414	1.40	188	1.20	132	0.65	29	0.65	29	†0.55	23	2.50	572	1.54	228	†1.84	324
29, ...	2.00	378	......	....	4.24	1500	3.50	1060	2.90	760	†1.05	97	0.60	26	0.80	46	0.55	23	1.90	344	1.54	228	1.94	358
30, ...	2.00	378	......	....	†3.85	1270	2.80	710	1.90	344	0.80	46	0.55	23	0.65	29	0.70	32	2.00	378	1.49	213	1.84	324
31, ...	2.10	414	......	....	3.40	1010	......	....	1.50	216	......	....	0.60	26	†0.65	29	......	....	2.40	530	......	......	1.54	228

†Interpolated. *Estimated. a Max. 9.65 feet at 5 p. m., *7700 sec. ft. b Max. 12.64 feet at 5 p. m., *12900 sec ft. ‡Creek frozen Feb. 8 to 22 inclusive and discharge estimated from Brokenstraw Creek at Youngsville and climatological records.

ESTIMATED MONTHLY DISCHARGE OF NORTH BRANCH FRENCH CREEK, AT KIMMEYTOWN, ERIE COUNTY, PA.

(Drainage area 190 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet. per square mile.	Depth in inches.
1913.					
January,	*7700	378	2050	10.789	12.439
February,	....	....	422	2.221	2.313
March,	*12900	258	1850	9.737	11.226
April,	1060	132	445	2.342	2.613
May,	760	64	175	0.921	1.062
June,	276	26	88	0.463	0.516
July,	86	23	39	0.205	0.237
August,	188	23	36	0.189	0.218
September,	75	17	27	0.142	0.158
October,	1720	26	281	1.479	1.705
November,	*5360	199	861	4.532	5.056
December,	428	143	293	1.542	1.777
The year,	*12900	17	547	2.880	39.320

*Estimated.

Creek frozen Feb. 8-22 inclusive and discharge estimated from Brokenstraw Creek at Youngsville and climatological records.

CUSSEWAGO CREEK.

DESCRIPTION OF BASIN.

Cussewago creek, one of the largest tributaries of French creek, draining ninety-two square miles, rises in the southern part of Erie county and flows in a general southerly direction, through Erie and Crawford counties, for a distance of about twenty miles, to the parent stream opposite Meadville. This creek follows a tortuous course and the flow is sluggish throughout its entire length, passing through a wild, shallow, drift filled valley, the side hills of which often rise abruptly from the plains, with numerous small tributaries coming in from the east and the west. The watershed lies entirely within the glacial area, the hills being low, rolling, and largely deforested, while the basin is well populated by an agricultural community.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge of this creek has been measured since May 2nd, 1910, at Jones' Farm, above Meadville, Crawford county.

OHIO BASIN—STATION NO. 8.

CUSSEWAGO CREEK ABOVE MEADVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On steel highway bridge, near Jones' Farm, four and one-half miles above Meadville, Crawford county, Pa.

RECORDS AVAILABLE—Discharge complete from May 2, 1910, to December 31, 1913.

DRAINAGE AREA—90 square miles.

GAGE—A chain gage is fastened to the handrail of the bridge. The elevation of zero is 1,071.77 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 14.83 feet. Bench Mark No. 1 is on top of upstream side of left abutment; elevation 1,085.40 feet above mean sea level. The gage is read once daily by J. E. Hofius.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is the outer edge of the left abutment.

CHANNEL—The channel above the station bends gradually to the left. The channel below the station bends to the left immediately below the bridge. Both banks are subject to overflow at gage height of about 8 feet. The bed is composed of soft material.

DISCHARGE TABLE FOR CUSSEWAGO CREEK, ABOVE MEADVILLE, CRAWFORD COUNTY, FROM MAY 3, 1910.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.50	2	.60	48	.70	166	.80	335	.90	686
.60	3	.70	53	.80	172	.90	346	9.00	709
.70	4	.80	58	.90	179	7.00	357	.10	732
.80	5	.90	63	5.00	186	.10	368	.20	756
.90	6	3.00	68	.10	193	.20	380	.30	780
1.00	7	.10	73	.20	200	.30	392	.40	806
.10	8	.20	78	.30	207	.40	405	.50	833
.20	9	.30	83	.40	214	.50	419	.60	861
.30	10	.40	88	.50	221	.60	434	.70	890
.40	12	.50	94	.60	228	.70	450	.80	920
.50	14	.60	100	.70	236	.80	466	.90	950
.60	16	.70	106	.80	244	.90	483	10.00	980
.70	18	.80	112	.90	252	8.00	501	.10	1010
.80	20	.90	118	6.00	260	.10	519	.20	1040
.90	23	4.00	124	.10	268	.20	538	.30	1070
2.00	26	.10	130	.20	276	.30	558	.40	1100
.10	29	.20	136	.30	285	.40	578	.50	1130
.20	32	.30	142	.40	294	.50	599		
.30	35	.40	148	.50	304	.60	620		
.40	39	.50	154	.60	314	.70	641		
.50	43	.60	160	.70	324	.80	663		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF CUSSEWAGO CREEK, ABOVE MEADVILLE, CRAWFORD CO., PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	7.50	419	3.05	70	6.50	304	5.30	207	3.30	83	1.70	18	1.00	7	0.70	4	0.70	4	0.70	4	4.40	148	2.60	48
2,	7.90	483	3.15	76	4.60	160	4.10	130	2.40	39	2.30	35	0.90	6	0.70	4	0.65	4	0.70	4	4.90	179	2.60	48
3,	8.15	528	3.35	86	4.20	136	3.80	112	2.00	26	3.90	118	0.85	6	0.60	3	0.60	3	1.10	8	3.80	112	2.65	50
4,	7.70	450	2.85	60	3.40	88	4.00	124	1.80	20	3.30	83	0.80	5	0.60	3	0.60	3	*2.50	43	3.20	78	2.60	48
5,	6.60	314	2.90	63	3.10	73	4.40	148	1.70	18	3.00	68	2.70	53	0.55	2	0.60	3	3.25	80	2.90	63	2.50	43
6,	6.15	272	2.70	53	3.20	78	4.20	136	1.65	17	2.60	48	5.80	244	0.55	2	0.60	3	2.20	32	2.70	53	2.40	39
7,	9.80	920	2.65	50	2.85	60	3.10	73	1.60	16	1.50	14	5.50	221	0.50	2	0.55	2	1.60	16	2.60	48	2.20	32
8,	10.65	*1170	2.20	32	2.80	58	2.80	58	1.30	10	3.25	80	3.50	94	0.50	2	0.50	2	1.30	10	2.90	63	4.10	130
9,	10.00	980	2.40	39	2.70	53	2.80	58	1.30	10	2.30	35	2.10	29	0.60	3	0.50	2	1.10	8	3.20	78	4.00	124
10,	8.95	698	2.40	39	6.50	304	2.60	48	1.30	10	1.50	14	2.50	43	0.60	3	0.50	2	1.00	7	4.00	124	3.80	112
11,	8.45	588	2.40	39	8.10	519	2.70	53	1.15	8	1.50	14	2.70	53	0.60	3	0.45	2	1.00	7	6.40	294	3.75	109
12,	8.9	686	2.50	43	9.30	780	4.80	172	1.10	8	1.20	9	1.85	22	0.70	4	0.45	2	1.05	8	7.60	434	3.20	78
13,	9.55	847	2.50	43	9.00	709	4.10	130	1.10	8	1.00	7	1.60	16	0.70	4	0.45	2	1.20	9	7.00	357	3.40	88
14,	9.00	709	2.05	28	8.20	538	3.10	73	1.05	8	1.00	7	1.50	14	0.70	4	0.50	2	1.15	8	11.00	*1270	3.75	109
15,	7.15	374	2.00	26	8.10	519	3.10	73	1.10	8	1.00	7	1.50	14	0.70	4	0.50	2	1.25	10	10.20	1040	4.45	151
16,	5.05	190	2.10	29	5.90	252	2.60	48	1.30	10	1.00	7	1.30	10	0.60	3	0.50	2	1.40	12	9.60	861	4.00	124
17,	8.00	501	2.40	39	4.20	136	2.50	43	1.70	18	0.90	6	1.20	9	0.55	2	0.50	2	1.20	9	8.85	674	3.50	94
18,	9.45	820	2.50	43	3.70	106	2.30	35	1.70	18	0.80	5	1.10	8	0.55	2	0.60	3	1.00	7	7.45	412	3.25	80
19,	11.60	*1270	2.30	35	3.65	103	2.10	29	1.40	12	0.80	5	1.10	8	0.60	3	2.30	35	1.10	8	5.30	207	3.10	73
20,	9.35	793	2.80	58	3.50	94	1.90	23	1.30	10	0.90	6	1.00	7	0.55	2	2.10	29	1.20	9	5.50	221	2.90	63
21,	8.20	538	5.30	207	3.10	73	1.80	20	1.10	8	1.00	7	0.95	6	0.50	2	1.30	10	1.70	18	5.60	228	2.60	48
22,	8.50	599	6.80	335	2.70	53	1.80	20	1.10	8	1.05	8	0.90	6	0.60	3	1.10	8	2.60	48	5.20	200	2.60	48
23,	8.45	588	7.40	405	2.60	48	1.70	18	1.20	9	1.00	7	0.70	4	0.85	6	1.20	9	3.60	100	4.05	127	2.70	53
24,	8.40	578	7.00	357	8.10	519	1.60	16	1.30	10	1.05	8	0.80	5	1.90	23	1.10	8	4.50	154	3.50	94	*3.00	68
25,	9.05	720	4.40	148	*16.00	*2730	1.60	16	1.30	10	1.30	10	0.70	4	1.70	18	1.00	7	6.25	280	3.05	70	4.95	182
26	8.35	568	3.20	78	*13.50	*2000	1.60	16	1.20	9	1.25	10	0.80	5	1.20	9	0.90	6	7.40	405	2.80	58	4.65	163
27,	5.60	228	3.80	112	*13.00	*1860	1.80	20	1.20	9	2.00	26	0.70	4	1.10	8	0.80	5	7.90	483	2.70	53	3.35	86
28,	4.05	127	4.90	179	10.00	980	3.00	68	2.00	26	1.80	20	0.80	5	0.90	6	0.70	4	7.20	380	2.60	48	4.05	127
29,	3.40	88	....	......	9.15	744	4.60	160	5.00	186	1.30	10	1.00	7	0.80	5	0.70	4	4.10	130	2.70	53	3.30	83
30,	2.70	53	....	......	8.50	599	5.10	193	3.30	83	1.00	7	0.70	4	0.70	4	0.70	4	3.90	118	2.65	50	2.95	66
31,	3.20	78	....	......	7.10	368	....	......	2.80	58	....	......	0.80	5	0.70	4	....	......	3.85	115	......	......	2.80	58

*Estimated.

ESTIMATED MONTHLY DISCHARGE OF CUSSEWAGO CREEK, ABOVE MEADVILLE, CRAWFORD COUNTY, PA.

(Drainage area 90 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	*1270	53	554	6.156	7.097
February,	405	26	99	1.100	1.145
March,	*2730	48	485	5.389	6.213
April,	207	16	77	0.856	0.955
May,	186	8	25	0.278	0.321
June,	118	5	23	0.256	0.286
July,	244	4	30	0.333	0.384
August,	23	2	5	0.056	0.065
September,	35	2	6	0.067	0.075
October,	483	4	82	0.911	1.050
November,	*1270	48	257	2.856	3.187
December,	182	32	85	0.944	1.088
The year,	*2730	2	144	1.600	21.866

*Estimated.

FRENCH CREEK.

DESCRIPTION OF BASIN.

French creek, in northwestern Pennsylvania, is one of the largest feeders of the Allegheny river, draining approximately 1,249 square miles, of which about 114 lie in New York State. It rises in the plateau in the southwestern corner of New York State, and flows approximately 25 miles southwesterly to the Pennsylvania line, crossing it into Erie county, Penn'a., 17 miles south of Lake Erie. From this point the stream continues in a general southwesterly direction through Erie and Crawford counties, cutting across the northeast corner of Mercer county into Venango, it follows a southeasterly course to its mouth at Franklin, the total length being about 100 miles. This stream throughout its entire length flows through a well inhabited, agricultural country, almost deforested, and containing in its basin many important and thriving communities. In general this stream flows through a broad valley, bounded by rolling hills and is tortuous in its course, flowing slowly with a gentle slope, often through long deep pools. From where it enters Venango county, however, to its mouth, a distance of 12½ miles, the fall is steeper, often broken by rapids, the hills on either side being higher.

The source of French creek lies at an approximate elevation of 1,700 feet, and to LeBouef, 12 miles below the Pennsylvania State line. it falls at the rate of 14 feet per mile; thence to the Mercer-Venango county line, a distance of 50 miles, the rate is about 3 feet per mile, and from this point to the mouth, approximately 12 miles the rate of fall is 8 feet per mile. All but a small section of this basin near the mouth, lies within the glacial area, and at Cambridge Springs, where the valley of the creek for about eight miles above and below the town is extremely broad and flat, is said to have been formerly the bed of a large glacial lake. There are many mineral springs in this section of the drainage basin. Throughout the entire drainage area of French creek are numerous lakes, ponds and swamps from which the tributaries of the stream emanate. Conneaut Lake lies in this watershed. The principal tributaries are—South Branch, Le Boeuf, Conewago creek, Conneautee creek, Muddy creek, Conneaut creek, Woodcock creek and Big Sugar creek. Numerous domestic and industrial water supplies are obtained from French creek and its tributaries. This creek at one time was extensively used by grist and flouring mills for power purposes, all but a few of these plants have been abandoned. At one period a state canal followed the lower portion of this stream.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since April 29, 1908, at Carlton, about 13 miles above the mouth.

OHIO BASIN—STATION NO. 9.

FRENCH CREEK AT CARLTON, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, steel, through-truss, highway bridge, near the Erie Railroad Station, at Carlton, Mercer county.

RECORDS AVAILABLE—Discharge complete from April 29, 1908, to December 31, 1913.

DRAINAGE AREA—1,070 square miles.

GAGE—A staff gage is fastened to the downstream side of the pier. The elevation of zero is arbitrary. Bench Mark No. 1 is right hand downstream corner of center pier coping; elevation 17.58 feet above gage datum. The gage is read twice daily by E. E. Dean.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading during extreme low stages. The initial point for soundings is end of upper angle of downstream handrail, at right bank.

CHANNEL—The channel above and below the station makes a gradual curve to the left. The right bank is high and not subject to overflow. The left bank is low and during floods, water passes around several feet deep for width of 400 feet. The bed is composed of sand, gravel and boulders.

DISCHARGE MEASUREMENTS OF FRENCH CREEK, AT CARLTON, MERCER COUNTY, PA.

(Drainage area 1070 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
28	1913 Aug. 23	Boehringer, ...	148	69	1.90	0.03	131	0.6 msmt.

DISCHARGE TABLE FOR FRENCH CREEK, AT CARLTON, MERCER COUNTY, FROM APRIL 29, 1908.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
—.10	75	.40	1300	.90	4350	.40	8720	.90	14960
0.00	90	.50	1390	5.00	4500	.50	8920	10.00	15300
.10	105	.60	1480	.10	4650	.60	9120	.10	15670
.20	125	.70	1570	.20	4800	.70	9320	.20	16070
.30	145	.80	1670	.30	4960	.80	9520	.30	16470
.40	170	.90	1775	.40	5120	.90	9720	.40	16880
.50	195	3.00	1880	.50	5280	8.00	9920	.50	17300
.60	220	.10	1985	.60	5450	.10	10120	.60	17730
.70	250	.20	2095	.70	5620	.20	10330	.70	18180
.80	280	.30	2210	.80	5790	.30	10550	.80	18630
.90	320	.40	2325	.90	5960	.40	10780	.90	19100
1.00	365	.50	2445	6.00	6130	.50	11010	11.00	19600
.10	410	.60	2565	.10	6300	.60	11250	.10	20100
.20	460	.70	2685	.20	6480	.70	11500	.20	20600
.30	520	.80	2810	.30	6660	.80	11750	.30	21100
.40	580	.90	2940	.40	6840	.90	12000	.40	21600
.50	640	4.00	3070	.50	7020	9.00	12250	.50	22100
.60	705	.10	3200	.60	7200	.10	12520	.60	22650
.70	770	.20	3340	.70	7380	.20	12800	.70	23200
.80	835	.30	3480	.80	7560	.30	13100	.80	23800
.90	905	.40	3620	.90	7740	.40	13400	.90	24400
2.00	980	.50	3760	7.00	7930	.50	13700	12.00	25000
.10	1055	.60	3900	.10	8120	.60	14000		
.20	1135	.70	4050	.20	8320	.70	14300		
.30	1215	.80	4200	.30	8520	.80	14620		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF FRENCH CREEK, AT CARLTON, MERCER COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis	G H	Dis.	G H	Dis
1, ...	5.15	4720	3.15	2040	4.80	4200	5.65	5540	2.82	1690	1.25	490	1.15	435	0.40	170	0.19	123	0.30	145	3.02	1900	1.97	958
2, ...	4.25	3410	2.35	1260	4.10	3200	4.80	4200	2.34	1250	1.85	870	0.86	304	0.40	170	0.14	113	0.35	158	2.60	1480	1.88	891
3, ...	4.90	4350	2.10	1060	3.00	1880	4.20	3340	1.82	849	2.45	1340	0.66	238	0.40	170	0.10	105	0.85	300	2.35	1260	1.78	822
4, ...	5.20	4800	2.75	1620	3.02	1900	4.10	3200	1.56	679	1.85	870	0.50	195	0.39	167	0.10	105	1.65	738	2.14	1090	1.69	764
5, ...	4.50	3760	2.55	1440	3.22	2120	4.05	3140	1.36	556	1.15	435	1.55	672	0.32	150	0.07	100	1.22	472	1.95	942	1.64	731
6, ...	5.10	4650	2.20	1140	2.75	1620	3.72	2710	1.17	445	0.92	329	3.45	2380	0.26	137	0.04	96	0.98	356	1.72	783	1.60	705
7, ...	8.00	9920	2.08	1040	2.30	1220	3.36	2280	1.04	383	0.95	342	3.10	1980	0.19	123	0.02	93	0.65	235	1.60	705	1.71	776
8, ...	10.15	15900	2.00	980	2.20	1140	3.16	2050	0.95	342	1.25	490	2.20	1140	0.11	107	0.01	92	0.48	190	1.70	770	1.55	672
9, ...	10.82	18700	2.00	980	2.35	1260	2.96	1840	0.90	320	1.00	365	1.80	835	0.05	98	**	76	0.37	162	2.45	1340	2.80	1670
10, ...	10.19	15700	2.00	980	4.90	4350	2.82	1690	0.90	320	0.99	360	1.80	835	0.00	90	....	76	0.29	143	3.70	2680	2.54	1430
11, ...	8.90	12000	1.98	965	5.95	6040	3.10	1980	0.90	320	0.92	329	1.78	822	0.01	92	....	76	0.25	135	5.10	4650	2.48	1370
12, ...	9.00	12200	1.86	877	6.80	7560	3.95	3000	0.90	320	0.80	280	1.56	679	0.04	96	....	76	0.33	152	4.50	3760	2.46	1350
13, ...	9.15	12700	1.72	783	6.70	7380	3.50	2440	0.90	320	0.67	241	1.30	520	0.05	98	....	76	0.43	178	5.95	6040	2.45	1340
14, ...	8.60	11200	2.20	1140	6.60	7200	3.55	2500	0.90	320	0.52	200	1.20	460	0.04	96	....	76	0.54	205	8.40	10800	2.60	1480
15, ...	6.15	6390	1.80	835	6.40	6840	3.30	2210	0.90	320	0.46	185	2.50	1390	0.04	96	....	76	0.58	215	9.70	14300	2.90	1780
16, ...	5.15	4720	1.70	770	5.55	5360	2.76	1630	1.02	374	0.45	182	1.72	783	0.04	96	....	76	0.52	200	9.50	13700	2.88	1750
17, ...	7.50	8920	1.70	770	4.60	3900	2.55	1440	1.02	374	0.45	182	1.31	526	0.02	93	....	76	0.44	180	7.30	8520	2.66	1530
18, ...	8.45	10900	1.75	802	3.70	2680	2.30	1220	1.08	401	0.42	175	0.96	347	0.00	90	0.02	93	0.65	235	5.30	4960	2.48	1370
19, ...	9.50	13700	1.68	757	3.45	2380	2.05	1020	1.08	401	0.44	180	0.78	274	0.00	90	0.12	109	0.52	200	4.55	3830	2.26	1180
20, ...	10.19	15700	2.10	1060	3.20	2100	1.78	822	1.01	370	0.48	190	0.58	215	0.00	90	0.30	145	0.55	208	4.40	3620	1.96	950
21, ...	9.30	13100	3.15	2040	2.92	1800	1.66	744	0.96	347	0.90	320	0.50	195	0.01	92	0.36	160	0.95	342	3.82	2840	1.82	849
22, ...	8.10	10100	4.65	3980	2.74	1610	1.58	692	0.90	320	0.94	338	0.48	190	0.00	90	0.30	145	1.80	835	3.95	3000	1.80	835
23, ...	7.25	8420	5.90	5960	2.55	1440	1.48	628	0.90	320	0.82	288	0.41	172	0.06	99	0.30	145	2.30	1220	3.50	2440	1.90	905
24, ...	7.80	9520	5.40	5120	7.35	8620	1.40	580	0.92	329	0.68	244	0.40	170	0.45	182	0.30	145	3.50	2440	3.02	1900	2.75	1620
25, ...	7.65	9220	4.65	3980	12.45	*27800	1.39	574	1.02	374	0.62	226	0.40	170	0.65	235	0.30	145	5.20	4800	2.75	1620	3.10	1980
26, ...	6.30	6660	3.25	2150	15.95	*56700	1.32	532	1.00	365	0.95	342	0.40	170	0.44	180	0.30	145	5.95	6040	2.50	1390	2.84	1710
27, ...	5.05	4580	3.08	1960	a16.81	*63900	1.51	646	1.00	365	1.40	580	0.40	170	0.29	143	0.30	145	5.55	5360	2.29	1210	2.66	1530
28, ...	4.25	3410	4.42	3650	13.90	*39500	1.75	802	1.30	520	1.70	770	0.40	170	0.19	123	0.30	145	4.15	3270	2.19	1130	2.46	1350
29, ...	3.65	2620	....	......	11.45	21800	3.25	2150	2.45	1340	1.90	905	0.50	195	0.14	113	0.30	145	3.25	2150	2.11	1060	2.27	1190
30, ...	3.35	2270	....	......	8.90	12000	3.45	2380	2.60	1480	1.60	705	0.44	185	0.04	96	0.30	145	2.70	1570	2.04	1010	2.15	1100
31, ...	3.25	2150	....	......	6.85	7650	....	......	1.90	905	....	......	0.40	170	0.03	94	....	......	2.80	1670	......	......	2.04	1010

Sept. 9-17 observer reported zero gage heights although water was actually below zero, for this period discharge is estimated from Allegheny River at Kittanning. a Max. 18.03 = *74200 sec. ft. ***Estimated.

ESTIMATED MONTHLY DISCHARGE OF FRENCH CREEK, AT CARLTON, MERCER COUNTY, PA.

(Drainage area 1070 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	18700	2150	8590	8.028	9.256
February,	5960	757	1790	1.673	1.742
March,	*74200	1140	10200	9.533	10.991
April,	5540	532	1930	1.804	2.012
May,	1690	320	549	0.513	.592
June,	1340	175	425	0.397	.443
July,	2380	170	548	0.512	.590
August,	235	90	121	0.113	.130
September,	160	....	111	0.104	.116
October,	6040	135	1110	1.037	1.195
November,	14300	705	3490	3.261	3.638
December,	1980	672	1210	1.131	1.304
The year,	74200	....	2510	2.342	32.009

*Estimated.

Sept. 9-17 discharge estimated from Allegheny River at Kittanning as water surface was below zero of gage.

SUGAR CREEK.

DESCRIPTION OF BASIN.

Sugar creek, one of the largest tributaries of French creek, rises in two branches in the southeast corner of Crawford county, Penn'a., and flows in a general southerly direction, with numerous large tributaries from the east and west, draining approximately 173 square miles, to its mouth at Sugar Creek Station, Venango county, Pa., a distance of approximately twenty miles. It flows through a well populated, agricultural region, the side hills being low and rolling and the valleys being wide and flat. There are numerous small villages in the watershed, the largest of which is Cooperstown borough. The production of oil is extensive throughout the valley.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge of this stream has been measured since May 6th, 1910, at Wyattville, about three miles above the mouth.

OHIO BASIN—STATION NO. 10

SUGAR CREEK AT WYATTVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On steel, highway bridge at Wyattville, Venango county, about 3 miles above the mouth of the creek.

RECORDS AVAILABLE—Discharge complete from May 6, 1910, to December 31, 1913.

DRAINAGE AREA—160 square miles.

GAGE—A chain gage is fastened to the wooden guardrail on the downstream side of the bridge. The elevation of zero is 1,050.96 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 13.75 feet. Bench Mark No. 1 is on top of left abutment, downstream side of bridge; elevation 1,062.48 feet above mean sea level. The gage is read once daily by Thos. G. Wyatt.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, or by wading at a point ¼ mile below bridge during low stages. The initial point for soundings is the face of the left abutment.

CHANNEL—The channel above and below the station is straight for 600 feet and 1,400 feet respectively. The right bank is high and not subject to overflow. The left bank overflows during extreme high stages. The bed is composed of gravel.

DISCHARGE TABLE FOR SUGAR CREEK, AT WYATTVILLE, VENANGO COUNTY, FROM MAY 7, 1910.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.00	10	2.00	94	3.00	555	4.00	1240	5.00	2090
.10	11	.10	115	.10	619	.10	1315	.10	2180
.20	13	.20	142	.20	683	.20	1395	.20	2270
.30	16	.30	177	.30	748	30	1475	.30	2360
.40	21	.40	220	40	813	.40	1555	.40	2450
.50	28	.50	268	.50	880	.50	1640	.50	2540
.60	37	.60	320	.60	950	.60	1730	60	2630
.70	47	.70	375	.70	1020	.70	1820	.70	2720
.80	59	.80	432	.80	1090	.80	1910	.80	2810
.90	75	.90	491	.90	1165	.90	2000	.90	2900
								6.00	2990

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF SUGAR CREEK, AT WYATTVILLE, VENANGO COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	2.60	320	2.30	177	2.80	432	3.00	555	2.10	115	2.30	177	2.10	115	1.60	37	1.50	28	1.70	47	1.80	59	2.00	94
2,	2.60	320	2.30	177	2.80	432	3.00	555	2.00	94	3.70	1020	2.40	220	1.60	37	1.50	28	1.80	59	1.80	59	2.00	94
3,	3.00	555	2.30	177	2.60	320	2.70	375	2.00	94	3.40	813	2.70	375	1.60	37	1.50	28	1.90	75	1.80	59	2.00	94
4,	2.60	320	2.10	115	2.40	220	2.70	375	1.90	75	3.00	555	3.00	555	1.50	28	1.50	28	1.90	75	1.80	59	1.90	75
5,	2.50	268	2.10	115	2.40	220	2.80	432	1.90	75	2.60	320	4.90	2000	1.50	28	1.50	28	1.80	59	1.80	59	1.90	75
6,	2.60	320	2.10	115	2.40	220	2.70	375	1.90	75	2.40	220	4.50	1640	1.50	28	1.50	28	1.70	47	1.90	75	1.90	75
7,	4.30	1480	2.00	94	2.20	142	2.60	320	1.90	75	2.10	115	2.60	220	1.50	28	1.50	28	1.50	28	1.90	75	2.00	94
8,	6.40	3350	2.00	94	2.20	142	2.50	268	1.80	59	2.00	94	2.60	320	1.50	28	1.50	28	1.50	28	1.90	75	2.10	115
9,	3.70	1020	2.00	94	2.20	142	2.40	220	1.80	59	2.00	94	2.10	115	1.50	28	1.10	21	1.50	28	2.00	94	2.10	115
10,	3.30	748	2.00	94	2.80	432	2.30	177	1.70	47	1.90	75	2.40	220	1.50	28	1.40	21	1.50	28	2.40	220	2.20	142
11,	4.10	1320	2.00	94	3.00	555	2.70	375	1.80	59	1.90	75	2.10	115	1.50	28	1.40	21	1.50	28	2.50	268	2.20	142
12,	4.40	1560	2.00	94	3.00	555	2.60	320	1.80	59	1.80	59	2.10	115	1.50	28	1.40	21	1.60	37	2.70	375	2.10	115
13,	3.40	813	2.00	94	3.00	555	2.40	220	1.80	59	1.80	59	1.90	75	1.50	28	1.40	21	1.50	28	3.10	619	2.10	115
14.	2.90	491	2.00	94	2.80	432	2.90	491	1.90	75	1.70	47	2.00	94	1.50	28	1.40	21	1.50	28	4.30	1480	2.10	115
15,	2.70	375	2.00	94	2.80	432	2.70	**375**	**2.00**	94	1.70	47	1.80	59	1.40	21	1.40	21	1.50	28	4.00	1240	2.10	115
16,	2.80	432	2.00	94	2.80	432	2.50	268	2.00	94	1.70	47	1.80	59	1.40	21	1.40	21	1.50	28	3.70	1020	2.10	115
17,	5.00	2090	2.00	94	2.60	320	2.40	220	1.90	75	1.70	47	1.70	47	1.40	21	1.40	21	1.50	28	2.90	491	2.10	115
18,	4.50	1640	2.00	94	2.60	320	2.20	142	1.90	75	1.70	47	1.90	75	1.40	21	1.50	28	1.60	37	2.60	320	2.00	94
19,	3.60	950	2.10	115	2.40	220	2.20	142	1.80	59	1.70	47	1.70	47	1.40	21	1.50	28	1.60	37	2.60	320	2.00	94
20,	3.40	813	2.20	142	2.20	142	2.10	115	1.70	47	1.70	47	1.80	59	1.40	21	1.60	37	1.70	47	2.40	220	2.00	94
21,	4.20	1400	2.20	142	2.20	142	2.10	115	1.80	59	2.90	491	1.70	47	1.40	21	1.60	37	1.70	47	2.40	220	1.90	75
22,	3.10	619	2.60	320	2.20	142	2.10	115	1.90	75	2.10	115	1.80	59	1.60	37	1.60	37	1.80	59	2.30	177	1.90	75
23,	4.30	1480	2.50	268	2.00	94	2.10	115	2.00	94	1.90	75	1.70	47	1.80	59	1.60	37	1.80	59	2.30	177	1.90	75
24,	4.00	1240	2.30	177	4.60	1730	2.10	115	1.90	75	1.90	75	1.80	59	1.70	47	1.60	37	1.80	59	2.20	142	1.90	75
25,	3.30	748	2.10	115	6.80	3710	2.10	115	1.80	59	1.90	75	1.70	47	1.50	28	1.70	47	1.90	75	2.20	142	1.90	75
26,	3.00	555	2.00	94	8.40	5150	2.10	115	1.80	59	3.90	1160	1.70	47	1.50	28	1.60	37	2.40	220	2.20	142	2.00	94
27,	2.80	432	2.20	142	6.00	2990	2.10	115	1.80	59	3.20	683	1.60	37	1.50	28	1.60	37	2.20	142	2.10	115	2.00	94
28,	2.50	268	2.50	268	4.20	1400	2.20	142	3.20	683	3.00	555	1.80	59	1.50	28	1.60	37	2.10	115	2.10	115	....	*90
29,	2.40	220	....	......	3.40	813	2.20	142	2.50	268	2.60	320	1.60	37	1.60	37	1.70	47	2.00	94	2.00	94	....	*90
30,	2.30	177	....	......	3.20	683	2.10	115	2.30	177	2.10	115	1.80	59	1.60	37	1.70	47	1.90	75	2.00	94	....	*90
31,	2.90	491	....	......	3.20	683	....	......	2.40	220	....	......	1.70	47	1.50	28	....	......	1.90	75	....	......	....	*90

*Creek frozen Dec. 28-31 inclusive and discharge estimated.

ESTIMATED MONTHLY DISCHARGE OF SUGAR CREEK, AT WYATTVILLE, VENANGO COUNTY, PA.

(Drainage area 160 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	3350	177	865	5.406	6.233
February,	320	94	135	.844	.879
March,	5150	94	781	4.881	5.627
April,	555	115	251	1.569	1.751
May,	683	47	106	.662	.763
June,	1160	47	256	1.600	1.785
July,	2000	37	231	1.444	1.665
August,	59	21	30	.188	.217
September,	47	21	30	.188	.210
October,	220	28	59	.369	.426
November,	1480	59	287	1.794	2.001
December,	142	75	97	.606	.699
The year,	5150	21	261	1.629	22.256

Creek frozen from Dec. 28 to 31 inclusive and discharge estimated.

CLARION RIVER.

DESCRIPTION OF BASIN.

The Clarion river, one of the largest tributaries of the Allegheny river, draining an area of approximately 1,232 square miles, rises in several branches in the southern part of McKean county. The upper branches flow in a general southerly direction to Johnsonburg, Elk county, where they unite to form the Clarion river proper. From this point the river flows in a general southwesterly direction, in a very tortuous course, to its mouth, at Foxburg, a distance of approximately 95 miles. The elevation of the main stream at Johnsonburg is 1,442 feet, while at its mouth it is 846 feet, giving an average slope of six and one-half feet per mile. From Johnsonburg the river flows through a fairly broad valley until it passes Ridgway, Elk county, where it enters a deep and narrow valley, with high sides, which gradually increase in height as the gorge narrows, so that when the river reaches Clarion county it flows in a narrow bed, with very high precipitous sides, often reaching an altitude of 400 feet above the stream. The hillsides below Ridgway have been practically deforested of their virgin timber and are now covered with a heavy second growth.

The upper portion of the main valley is more thickly inhabited and more largely devoted to agriculture than is the lower section, in which portion the main valley is very sparsely inhabited and largely forest covered, while the plateau land, on either side, is quite generally under cultivation. In the upper portions of the watersheds of the tributaries much of the timber has been destroyed by forest fires and removed by pulp and paper companies, but there are numerous small bituminous coal operations, while in the lower part of the main valley gas wells, in considerable quantities are operated. In Elk county the tributaries are used quite considerably for domestic and industrial water supply, while in Clarion county, with the exception of the borough of Clarion, the stream is little used. In Elk county the stream is badly polluted by tanneries, paper mills and chemical works. The main tributaries are the West Branch, Elk, Little Toby, in Elk county, and Licking, Deer, Piney, Tobey and Big Mills creeks, in Clarion county.

The mean annual precipitation over this watershed is from 40 to 45 inches.

Discharge measurements have been made since March, 1908, at Clarion, about thirty miles above the mouth.

OHIO BASIN—STATION NO. 11.

CLARION RIVER AT CLARION, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, about one mile from Clarion, Clarion county.

RECORDS AVAILABLE—Discharge complete from November 22, 1909, to December 31, 1913.

DRAINAGE AREA—910 square miles.

GAGE—A Mott gage is attached to the downstream handrail of the bridge. The elevation of zero is 1,052.0 feet. The length of tape from the bottom of the weight to the zero is 33.87 feet. Bench Mark No. 1 is top line of right abutment, elevation 1,080.48 feet above mean sea level. The gage is read once daily by J. A. Miller.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is right end top angle of downstream handrail.

CHANNEL—The channel above and below the station is straight for 800 feet and 1,200 feet respectively. Both banks are high and not subject to overflow. The bed is composed of rock, gravel and boulders. There is a good velocity under the bridge at all stages.

REMARKS—The gage heights at this station are furnished by the United States Weather Bureau.

DISCHARGE TABLE FOR CLARION RIVER, AT CLARION, CLARION COUNTY, FROM JAN, 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
—0.60	100	.40	1740	.40	6660	.40	14720	.40	23420
—0.50	110	.50	1840	.50	6880	.50	15010	.50	23710
—0.40	120	.60	1950	.60	7100	.60	15300	.60	24000
—0.30	135	.70	2060	.70	7330	.70	15590	.70	24290
—0.20	155	.80	2180	.80	7560	.80	15880	.80	24580
—0.10	180	.90	2300	.90	7790	.90	16170	.90	24870
0.00	215	3.00	2425	6.00	8020	9.00	16460	12.00	25160
0.10	250	.10	2550	.10	8260	.10	16750	.10	25450
.20	285	.20	2680	.20	8500	.20	17040	.20	25740
.30	325	.30	2810	.30	8750	.30	17330	.30	26030
.40	370	.40	2950	.40	9000	.40	17620	.40	26320
.50	420	.50	3095	.50	9260	.50	17910	.50	26610
.60	470	.60	3240	.60	9530	.60	18200	.60	26900
.70	520	.70	3390	.70	9800	.70	18490	.70	27190
.80	570	.80	3550	.80	10080	.80	18780	.80	27480
.90	620	.90	3710	.90	10370	.90	19070	.90	27770
1.00	675	4.00	3880	7.00	10660	10.00	19360	13.00	28060
.10	735	.10	4050	.10	10950	.10	19650	.10	28350
.20	795	.20	4220	.20	11240	.20	19940	.20	28640
.30	860	.30	4400	.30	11530	.30	20230	.30	28930
.40	925	.40	4600	.40	11820	.40	20520	.40	29220
.50	995	.50	4800	.50	12110	.50	20810	.50	29510
.60	1065	.60	5000	.60	12400	.60	21100	.60	29800
.70	1135	.70	5200	.70	12690	.70	21390	.70	30090
.80	1210	.80	5400	.80	12980	.80	21680	.80	30380
.90	1290	.90	5600	.90	13270	.90	21970	.90	30670
2.00	1370	5.00	5800	8.00	13560	11.00	22260	14.00	30960
.10	1460	.10	6010	.10	13850	.10	22550		
.20	1550	.20	6220	.20	14140	.20	22840		
.30	1640	.30	6440	.30	14430	.30	23130		

Note.—This table is only applicable subsequent to Jan. 1, 1912, and is based on former curve and 3 high water measurements made during 1913.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF CLARION RIVER, AT CLARION, CLARION COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	3.24	2730	2.82	2200	4.51	4820	4.31	4420	3.52	3120	3.43	2990	2.03	1400	0.44	390	—0.04	201	0.30	325	0.30	325	0.85	595
2, ...	2.64	1990	2.52	1860	3.51	3110	3.51	3110	3.12	2580	3.13	2590	1.93	1310	0.34	343	—0.16	165	0.30	325	0.20	285	0.85	595
3, ...	2.34	1680	2.52	1860	2.81	2190	3.11	2560	2.82	2200	2.83	2220	1.83	1230	0.34	343	—0.26	143	0.30	325	0.10	250	0.95	648
4, ...	4.54	4880	2.32	1660	3.01	2440	2.91	2310	2.52	1860	2.53	1870	1.53	1020	0.34	343	—0.26	143	0.30	325	0.10	250	0.75	545
5, ...	3.94	3780	2.32	1660	3.21	2690	2.91	2310	2.32	1660	2.23	1580	1.33	880	0.14	264	—0.26	143	0.70	520	0.00	215	0.60	470
6, ...	3.64	5300	....	650	3.11	2560	2.81	2190	2.02	1390	2.03	1400	1.13	753	0.14	264	—0.36	126	0.70	520	0.10	250	0.55	445
7, ...	6.34	8850	....	650	2.51	1850	2.61	1960	1.82	1230	2.03	1400	1.13	753	0.04	229	—0.26	143	0.30	325	—0.10	180	0.75	545
8, ...	15.34	*34800	....	650	2.11	1470	2.31	1650	1.52	1010	1.93	1310	1.03	693	0.04	229	—0.26	143	0.20	285	0.00	215	1.25	828
9, ...	11.84	24700	....	650	1.81	1220	2.01	1380	1.32	873	1.83	1230	1.03	693	0.04	229	—0.26	143	0.00	215	0.10	250	1.15	765
10, ...	7.14	11100	....	650	2.51	1850	1.91	1300	1.32	873	1.83	1230	b2.68	2040	0.24	301	—0.26	143	—0.10	180	0.40	370	1.00	675
11, ...	6.04	8120	....	650	3.31	2820	2.21	1560	1.12	747	1.73	1160	3.63	3280	0.74	540	—0.26	143	—0.20	155	0.50	420	0.95	648
12, ...	8.24	14300	....	650	3.81	3570	2.81	2190	0.92	631	1.53	1020	3.[illegible]3	2720	0.54	440	—0.26	143	0.30	325	0.60	470	0.95	648
13, ...	7.54	12200	....	650	3.31	2820	2.61	1960	0.92	631	1.53	1020	2.83	2220	0.34	343	—0.16	165	0.10	250	1.10	735	1.05	705
14, ...	5.84	7650	....	650	3.31	2820	2.81	2190	0.92	631	1.33	880	2.53	1870	0.14	264	—0.36	126	0.10	250	5.00	5800	1.05	705
15, ...	4.84	5480	....	650	4.81	5420	2.61	1960	1.32	873	1.13	753	2.13	1490	0.04	229	—0.36	126	—0.10	180	5.10	6010	1.30	860
16, ...	4.24	4290	....	650	4.31	4420	2.31	1650	1.32	873	1.13	753	1.73	1160	0.04	229	—0.36	126	0.00	215	5.00	5800	1.35	892
17, ...	4.84	5480	....	650	4.01	3900	2.01	1380	1.12	747	1.13	753	1.73	1160	—0.06	194	—0.36	126	—0.20	155	4.30	4400	1.25	828
18, ...	7.14	11100	....	650	3.81	3570	1.91	1300	1.12	747	1.03	693	1.43	946	—0.16	165	—0.16	165	0.00	215	4.10	4050	1.05	705
19, ...	7.84	13100	....	650	3.31	2820	2.01	1380	1.12	747	0.93	636	1.13	753	—0.26	143	—0.06	194	0.10	250	3.60	3240	0.95	648
20, ...	5.84	7650	....	650	2.91	2310	1.91	1300	1.12	747	0.93	636	1.73	1160	—0.16	165	0.04	229	0.60	470	2.90	2300	1.00	675
21, ...	6.34	8850	....	650	2.81	2190	1.81	1220	0.92	631	2.33	1670	1.33	880	—0.16	165	0.34	343	0.70	520	2.30	1640	0.95	648
22, ...	5.54	7880	....	1100	2.61	1960	1.61	1070	0.92	631	2.73	2100	1.33	880	—0.16	165	0.24	301	0.80	570	2.10	1460	0.85	595
23, ...	5.34	6530	....	1100	2.31	1650	1.31	866	1.32	873	2.33	1670	1.13	753	—0.06	194	0.04	229	0.50	420	1.90	1290	0.85	595
24, ...	7.54	12200	....	1100	3.11	2560	1.11	741	2.82	2200	1.93	1310	1.33	880	0.04	229	0.04	229	0.70	520	1.90	1290	1.15	765
25, ...	6.04	8120	....	1100	a13.33	29000	1.11	741	2.32	1660	1.83	1230	1.23	814	0.54	440	0.04	229	2.20	1550	1.50	995	1.40	925
26, ...	5.04	5880	....	1100	12.77	27400	1.01	681	1.92	1310	2.33	1670	1.03	693	0.24	301	—0.06	194	4.50	4800	1.20	795	1.45	960
27, ...	4.84	5480	....	1100	12.21	25800	1.51	1000	2.52	1860	3.13	2590	1.03	693	0.04	229	—0.16	165	2.90	2300	0.80	570	1.45	960
28, ...	4.14	4120	....	4560	10.11	19700	3.51	3110	4.12	4080	2.83	2220	0.83	585	—0.16	165	—0.16	165	1.90	1290	0.90	620	1.25	828
29, ...	3.54	3150	....	......	7.11	11000	4.61	5020	4.32	4440	2.53	1870	0.63	485	0.04	229	—0.16	165	1.10	735	1.00	675	1.25	828
30, ...	3.14	2660	....	......	6.61	9560	4.11	4070	4.12	4080	2.33	1670	0.63	485	—0.16	165	—0.16	165	0.90	620	1.00	675	1.90	1290
31, ...	2.84	2230	....	......	5.01	5820	. ..	......	3.82	3580	....	......	0.53	435	—0.26	143	......	.....	0.50	420	......	....	1.85	1250

Feby.—frozen from 6th to 28th inclusive and discharge estimated from Red Bank Creek at St. Charles. a Max. 13.81 at noon=30400′ sec. ft. b Max. 3.83 at noon=3600′ sec. ft. *Estimated.

ESTIMATED MONTHLY DISCHARGE OF CLARION RIVER, AT CLARION, CLARION COUNTY, PA.

(Drainage area 910 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	*34800	1680	8200	9.011	10.389
February,	....	....	1120	1.231	1.282
March,	30400	1220	6300	6.923	7.982
April,	5020	681	1950	2.143	2.391
May,	4440	631	1600	1.758	2.027
June,	2990	636	1470	1.615	1.802
July,	3600	435	1130	1.231	1.419
August,	540	143	260	0.286	0.330
September,	343	126	174	0.191	0.213
October,	4800	155	630	0.692	0.797
November,	6010	180	1530	1.681	1.875
December,	1290	445	744	0.818	0.943
The year,	*34800	126	2090	2.298	31.450

*Estimated.

River frozen from Feb. 6th to 28 incl., and discharge estimated from Red Bank Creek at St. Charles.

RED BANK CREEK.

DESCRIPTION OF BASIN.

Red Bank creek, an important feeder of the Allegheny river from Jefferson, Clarion and Armstrong counties, drains an area of approximately 585 square miles. Rising in two streams, Sandy Lick and North Branch, the former heading in Clearfield county, and the latter in Jefferson county. Red Bank creek is formed by their junction at Brookville, Jefferson county, and thence flows in a general westerly direction, with many twists and turns, to its mouth at Red Bank, a distance of about 44 miles. The stream flows through a hilly country, sparsely populated, except in the valley where farming and lumbering is carried on. The slope of the creek is rapid, flowing as it does in a narrow gorge between high hills, the channel being full of large rocks. The junction lies at an approximate elevation of 1,235 feet, and the mouth at 844 feet, giving the stream an average fall of 9 feet per mile. There are a few boroughs and numerous villages along the stream, some of which obtain their domestic water supply from it. Some bituminous coal mining and oil and gas wells are found in this basin.

The mean annual precipitation over this watershed is from 40 to 50 inches.

The discharge of this stream has been measured at St. Charles, since October 19th, 1909, approximately 15 miles above the mouth.

OHIO BASIN—STATION NO. 12.

RED BANK CREEK AT ST. CHARLES, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, wooden, through-truss, private railroad bridge, at St. Charles, Clarion county.

RECORDS AVAILABLE—Discharge complete from October 19, 1909, to December 31, 1913.

DRAINAGE AREA—540 square miles.

GAGE—A standard chain gage is fastened to the bridge floor on the upstream side, about 50 feet from north abutment. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 24.31 feet. Bench Mark No. 1 is rod seat chiseled in east corner stone, upper course of nose of east abutment (left hand looking upstream), painted white, 7 feet, more or less, below top of bridge seat; elevation 13.32 feet above gage datum. Bench Mark No. 2 is rod seat chiseled in southeast corner of top of same abutment, (bridge seat), painted white, 7 feet, more or less above B. M. No. 1; elevation 20.21 feet above gage datum. The gage is read twice daily by W. H. Bish.

DISCHARGE MEASUREMENTS—Taken from the upstream side of the bridge, and by wading during low stages. The initial point for soundings is top edge of bridge seat, north abutment.

CHANNEL—The channel above and below the station is straight for a short distance. The right bank overflows during extreme high stages. The left bank is high and not subject to overflow. The bed is composed of large rocks, but fairly regular. The current is sluggish under the bridge at low stages.

DISCHARGE TABLE FOR RED BANK CREEK, AT ST. CHARLES, CLARION COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
0.60	5	.10	420	.60	1585	.10	4030	.60	6805
.70	10	.20	470	.70	1710	.20	4215	.70	6990
.80	15	.30	520	.80	1840	.30	4400	.80	7175
.90	25	.40	570	.90	1975	.40	4585	.90	7360
1.00	40	.50	630	4.00	2120	.50	4770	7.00	7545
.10	60	.60	700	.10	2275	.60	4955	.10	7730
.20	80	.70	770	.20	2440	.70	5140	.20	7915
.30	110	.80	840	.30	2610	.80	5325	.30	8100
.40	140	.90	910	.40	2780	.90	5510	.40	8285
.50	175	3.00	990	.50	2950	6.00	5695	.50	8470
.60	210	.10	1070	.60	3125	.10	5880	.60	8655
.70	245	.20	1150	.70	3300	.20	6065	.70	8840
.80	285	.30	1240	.80	3475	.30	6250	.80	9025
.90	330	.40	1350	.90	3660	.40	6435	.90	9210
2.00	375	.50	1465	5.00	3845	.50	6620	8.00	9395

Note:—This table is only applicable subsequent to Jan. 1, 1912, and is based on 3 discharge measurements made during 1911-12-13, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF RED BANK CREEK, AT ST. CHARLES, CLARION COUNTY, PA.

1913.	JAN		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	3.84	1890	3.18	1130	3.41	1360	3.47	1430	3.23	1180	2.92	926	1.75	265	1.62	217	1.31	113	1.20	80	2.19	465	2.12	430
2, ...	3.29	1230	2.88	896	3.11	1080	3.25	1200	2.93	934	2.75	805	2.00	375	1.57	200	1.21	83	2.36	550	2.02	384	2.10	420
3, ...	3.37	1320	2.38	560	2.91	918	3.18	1130	2.76	812	2.65	735	2.30	520	1.52	182	1.14	68	2.20	470	1.84	303	2.02	384
4, ...	3.89	1960	2.26	500	3.14	1100	2.95	950	2.60	700	2.47	612	2.23	485	1.44	154	1.09	58	2.10	420	1.72	253	2.02	384
5, ...	4.64	3200	2.23	485	3.21	1160	2.88	896	2.46	606	2.35	545	2.00	375	1.37	131	1.11	62	1.96	357	1.64	224	2.00	375
6, ...	5.24	4290	2.18	460	3.06	1040	2.72	784	2.38	560	2.15	445	2.15	445	1.32	116	1.09	58	1.73	257	1.59	206	1.95	352
7, ...	7.34	8170	2.10	420	2.66	742	2.55	665	2.33	535	1.92	339	2.00	375	1.24	92	1.14	68	1.53	186	1.54	189	3.55	1520
8, ...	11.79	†16400	2.06	402	2.48	618	2.35	545	2.26	500	1.79	281	1.70	245	1.12	64	1.37	131	1.73	257	1.49	172	3.80	1840
9.	11.69	†16200	1.98	366	2.46	606	2.38	560	2.10	420	1.69	242	1.58	185	1.04	48	1.29	107	1.66	231	1.56	196	3.45	1410
10, ...	8.29	†9920	2.13	435	3.11	1080	2.32	530	1.98	366	1.57	200	5.15	4120	1.02	44	1.31	113	1.50	175	5.39	4570	3.15	1110
11, ...	6.49	6600	2.10	420	3.41	1360	2.28	510	1.88	321	1.57	200	4.80	3480	1.74	261	1.29	107	1.53	186	5.09	4010	2.98	974
12, ...	8.45	†10200	2.06	402	3.51	1480	2.32	530	1.80	285	1.57	200	4.60	3120	1.64	224	1.21	83	1.36	128	4.79	3160	2.75	805
13, ...	6.64	6880	2.10	420	3.66	1660	2.55	665	1.80	285	1.52	182	4.40	2780	1.57	200	1.14	68	1.38	134	4.59	3110	2.58	686
14, ...	5.74	5210	2.10	420	3.91	1990	3.15	1110	1.70	245	1.47	164	4.23	2490	1.52	182	1.09	58	1.33	119	5.54	4840	2.50	630
15, ...	4.34	2680	1.93	344	4.41	2800	2.98	974	2.23	485	1.42	147	4.00	2120	1.44	154	1.04	48	1.28	104	5.39	4570	2.38	560
16, ...	3.89	1960	1.93	344	4.06	2210	2.88	896	2.08	411	1.42	147	3.70	1710	1.34	122	0.99	38	1.20	80	4.79	3460	2.38	560
17, ...	5.39	4570	1.98	366	3.81	1850	2.65	735	2.00	375	1.42	147	3.35	1300	1.34	122	0.94	31	1.13	66	4.34	2680	2.30	520
18, ...	5.89	5490	2.06	402	3.51	1480	2.48	618	1.86	312	1.37	131	2.85	875	1.32	116	0.99	38	1.20	80	3.99	2110	2.22	480
19, ...	5.64	5030	1.86	312	3.34	1280	2.30	520	1.76	269	1.37	131	2.50	630	1.20	80	0.97	36	1.33	119	3.69	1700	2.15	445
20, ...	4.84	3550	1.80	285	3.11	1080	2.18	460	1.76	269	1.37	131	2.20	470	1.12	64	1.11	62	2.18	460	3.39	1340	2.10	420
21, ...	5.09	4010	1.93	344	2.71	777	2.18	460	1.56	196	2.22	480	1.90	330	1.04	48	1.21	83	2.40	570	3.16	1120	2.10	420
22, ...	4.64	3200	2.63	721	2.64	728	2.12	430	1.46	161	2.52	644	1.60	210	1.02	44	1.54	189	2.33	535	3.02	1010	2.10	420
23, ...	5.09	4010	2.93	934	2.56	672	2.10	420	1.90	330	2.42	582	3.45	1410	1.11	68	1.47	164	2.20	470	2.69	763	2.05	398
24, ...	5.75	5230	2.68	756	2.68	756	2.02	384	2.23	485	2.12	430	3.20	1150	1.27	101	1.39	137	2.28	510	2.42	582	2.00	375
25, ...	5.39	4570	2.13	435	10.56	†14100	2.00	375	2.36	550	1.97	362	2.80	840	1.20	80	1.34	122	4.16	2370	2.26	500	1.95	352
26, ...	5.04	3920	2.10	420	*11.89	†16600	2.05	398	2.46	606	2.17	455	2.37	555	1.12	64	1.29	107	3.48	1440	2.24	490	1.90	330
27, ...	4.64	3200	2.43	588	10.46	†13900	2.25	495	3.48	1440	2.42	582	2.07	406	1.04	48	1.24	92	3.03	1010	2.19	465	1.85	308
28, ...	3.99	2110	4.68	3260	6.36	6360	3.55	1520	4.88	3620	2.12	430	1.87	316	1.02	44	1.19	78	2.86	882	2.14	440	1.80	285
29, ...	3.34	1280	....	......	4.76	3400	3.85	1910	3.58	1560	1.97	362	1.75	265	1.12	64	1.29	107	2.70	770	2.14	440	1.80	285
30, ...	2.84	868	....	......	4.26	2540	3.55	1520	3.36	1310	1.95	352	1.75	265	1.40	140	1.19	78	2.53	651	2.09	416	1.80	285
31, ...	2.81	847	....	......	4.01	2140	....	......	3.13	1090	....	......	1.70	245	1.24	92	....	......	2.36	550	......	......	1.88	321

*Max. 12.16′ at noon = †17000 sec. ft. †Estimated.

ESTIMATED MONTHLY DISCHARGE OF RED BANK CREEK, AT ST. CHARLES, CLARION COUNTY, PA.

(Drainage area 540 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
1913.	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January,	†16400	847	4840	8.963	10.333
February,	3260	285	601	1.113	1.159
March,	†17000	606	2870	5.315	6.128
April,	1910	375	787	1.457	1.626
May,	3620	161	684	1.267	1.461
June,	926	131	380	0.704	0.785
July,	4120	185	1040	1.926	2.221
August,	261	44	115	0.213	0.246
September,	189	31	86	0.159	0.178
October,	2370	66	459	0.850	0.980
November,	4840	172	1480	2.741	3.058
December,	1840	285	583	1.080	1.245
The year,	†17000	31	1160	2.148	29.420

†Estimated.

OHIO BASIN—STATION NO. 13.

ALLEGHENY RIVER AT KITTANNING, PA.

DESCRIPTION OF STATION.

LOCATION—On 5 span, steel, through-truss, highway bridge at Market Street, Kittanning, Armstrong county.

RECORDS AVAILABLE—Discharge complete from August 18, 1904, to December 31, 1913.

DRAINAGE AREA—9,010 square miles.

GAGE—A standard chain gage is bolted to the upstream handrail in first span from the left bank. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 38.62 feet. Bench Mark No. 1 is west corner of top course of stones of left abutment; elevation 33.83 feet above gage datum. The gage is read once daily by Blaine Mast.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is the left end of handrail, downstream side of bridge.

CHANNEL—The channel above and below the station is straight for 500 feet and 1,000 feet respectively. Both banks are high, clean, and not subject to overflow. The bed is composed of clean gravel, and the current is swift.

DISCHARGE MEASUREMENTS OF ALLEGHENY RIVER, AT KITTANNING, ARMSTRONG COUNTY, PA.

(Drainage area 9010 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
41	1913. Aug. 22	Boehringer, ...	574	1888	0.53	1.56	1006	Surface and 0.6 msmt.

DISCHARGE TABLE OF ALLEGHENY RIVER, AT KITTANNING, ARMSTRONG COUNTY, FROM AUG. 18, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.30	775	.30	10535	.30	33725	.30	63220	.30	99590
.40	880	.40	10980	.40	34400	.40	64040	.40	100600
.50	990	.50	11440	.50	35100	.50	64870	.50	101620
.60	1100	.60	11900	.60	35800	.60	65700	.60	102640
.70	1220	.70	12370	.70	36500	.70	66540	.70	103670
.80	1340	.80	12840	.80	37200	.80	67390	.80	104710
.90	1465	.90	13315	.90	37900	.90	68240	.90	105750
2.00	1605	6.00	13800	10.00	38600	14.00	69100	18.00	106800
.10	1755	.10	14285	.10	39310	.10	69970	.10	107850
.20	1920	.20	14770	.20	40020	.20	70840	.20	108910
.30	2085	.30	15260	.30	40730	.30	71720	.30	109970
.40	2260	.40	15755	.40	41440	.40	72600	.40	111040
.50	2445	.50	16250	.50	42150	.50	73490	.50	112120
.60	2640	.60	16760	.60	42860	.60	74380	.60	113200
.70	2850	.70	17290	.70	43570	.70	75270	.70	114290
.80	3060	.80	17840	.80	44280	.80	76170	.80	115390
.90	3270	.90	18410	.90	44990	.90	77080	.90	116490
3.00	3490	7.00	19000	11.00	45700	15.00	77900	19.00	117600
.10	3715	.10	19590	.10	46420	.10	78800	.10	118710
.20	3940	.20	20190	.20	47140	.20	79700	.20	119820
.30	4165	.30	20790	.30	47860	.30	80600	.30	120930
.40	4390	.40	21400	.40	48590	.40	81500	.40	122050
.50	4620	.50	22025	.50	49320	.50	82410	.50	123170
.60	4850	.60	22650	.60	50050	.60	83320	.60	124290
.70	5080	.70	23275	.70	50780	.70	84230	.70	125410
.80	5335	.80	23900	.80	51520	.80	85150	.80	126540
.90	5580	.90	24525	.90	52260	.90	86070	.90	127670
4.00	5840	8.00	25150	12.00	53000	16.00	87000	20.00	128800
.10	6105	.10	25800	.10	53750	.10	87930	21.00	140200
.20	6380	.20	26450	.20	54510	.20	88870	22.00	152000
.30	6660	.30	27100	.30	55280	.30	89810	23.00	164200
.40	6955	.40	27750	.40	56060	.40	90760	24.00	176800
.50	7260	.50	28400	.50	56840	.50	91720	25.00	189600
.60	7600	.60	29050	.60	57630	.60	92680	26.00	203000
.70	7985	.70	29700	.70	58420	.70	93650	27.00	217000
.80	8375	.80	30350	.80	59210	.80	94630	28.00	231000
.90	8775	.90	31025	.90	60000	.90	95610	29.00	245000
5.00	9200	9.00	31700	13.00	60800	17.00	96600	30.00	259000
.10	9635	.10	32375	.10	61600	.10	97590		
.20	10080	.20	33050	.20	62410	.20	98590		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF ALLEGHENY RIVER, AT KITTANNING, ARMSTRONG COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	8.70	29700	7.90	24500	10.60	42900	12.30	55300	10.90	45000	6.10	14300	4.60	7600	2.05	1680	1.55	1040	2.40	2260	6.30	15300	4.80	8380
2, ...	7.80	23900	7.20	20200	9.80	37200	10.80	44300	10.15	39700	5.75	12600	4.10	6100	2.00	1600	1.50	990	2.30	2080	5.60	11900	4.65	7790
3, ...	7.50	22000	6.60	16800	9.10	32400	9.40	34400	9.30	33700	5.40	11000	3.90	5580	1.95	1540	1.50	990	2.30	2080	5.05	9420	4.50	7260
4, ...	8.80	30300	6.15	14500	7.80	23900	8.85	30700	8.20	26400	5.10	9640	3.60	4850	1.95	1540	1.45	935	2.50	2440	4.50	7260	4.35	6810
5, ...	8.20	26400	5.50	11400	7.10	19600	8.30	27100	7.40	21400	4.80	8380	3.35	4280	1.90	1460	1.45	935	2.45	2350	4.10	6100	4.20	6380
6, ...	9.50	35100	4.80	8380	6.45	16000	7.95	24800	6.60	16800	4.55	7430	3.15	3830	1.85	1400	1.40	880	2.35	2170	3.80	5340	4.20	6380
7, ...	14.55	73900	4.65	7790	5.80	12800	7.60	22600	5.95	13600	4.30	6660	2.95	3380	1.80	1340	1.35	828	2.35	2170	3.60	4850	5.50	11400
8, ...	21.35	144000	4.70	7980	5.20	10100	7.25	20500	5.20	10100	4.05	5970	2.85	3160	1.75	1280	1.30	775	2.25	2000	4.40	6960	6.40	15800
9, ...	a22.54	159000	4.75	8180	5.10	9640	6.90	18400	4.85	8580	3.90	5580	2.70	2850	1.75	1280	1.27	*744	2.25	2000	5.50	11400	5.90	13300
10, ...	17.40	101000	4.90	8770	6.30	15300	6.70	17300	4.55	7430	3.60	4850	2.60	2640	1.80	1340	1.25	*722	2.20	1920	6.90	18400	5.65	12100
11, ...	17.10	97600	5.00	9200	7.70	23300	7.20	20200	4.20	6380	3.35	4280	3.50	4620	1.90	1460	1.20	*670	2.15	1840	8.30	27100	5.40	11000
12, ...	18.00	107000	5.05	9420	9.60	35800	7.05	19300	3.95	5710	3.20	3940	5.10	9640	2.10	1760	1.18	*650	2.05	1680	11.20	47100	5.20	10100
13, ...	15.60	83300	5.20	10100	13.05	61200	6.90	18400	4.40	6960	3.20	3940	5.25	10300	2.05	1680	1.15	*620	1.95	1540	13.10	61600	4.90	8780
14, ...	13.90	68200	5.10	9630	12.10	53800	7.80	23900	4.45	7110	3.15	3830	5.05	9420	2.00	1600	1.15	*620	1.90	1460	12.05	53400	4.70	7980
15, ...	12.40	56100	4.95	8990	10.90	45000	7.50	22000	4.20	6380	3.05	3600	4.50	7260	1.95	1540	1.10	*570	1.85	1400	10.80	44300	4.55	7430
16, ...	12.80	59200	4.80	8380	9.60	35800	7.15	19900	3.90	5580	2.90	3270	3.70	5080	1.90	1460	1.10	*570	2.60	2640	9.90	37900	4.80	8380
17, ...	13.10	61600	4.70	7980	8.90	31000	6.80	17800	3.65	4960	2.75	2960	3.20	3940	1.85	1400	1.10	*570	2.85	3160	9.20	33000	5.10	9640
18, ...	11.90	52300	4.65	7790	8.20	26400	6.55	16500	3.40	4390	2.55	2540	2.80	3060	1.85	1400	1.20	*670	3.40	4390	8.35	27400	5.60	11900
19, ...	11.00	45700	4.55	7430	7.75	23600	6.10	14300	3.20	3940	2.70	2850	2.60	2640	2.30	2080	1.40	880	4.65	7790	7.50	22000	5.80	12800
20, ...	16.00	87000	4.45	7110	7.40	21400	5.65	12100	3.70	5080	3.40	4390	2.45	2350	2.40	2260	1.55	1040	4.80	8380	7.10	19600	5.65	12100
21, ...	14.40	72600	4.40	6950	7.10	19600	5.30	10500	3.85	5460	3.55	4740	2.20	1920	2.30	2080	1.80	1340	4.70	7980	6.65	17000	5.40	11000
22, ...	14.60	74400	6.45	16000	6.90	18400	5.10	9640	3.75	5200	3.45	4500	2.05	1680	1.88	1440	2.05	1680	5.90	13300	6.35	15500	5.25	10300
23, ...	13.10	61600	11.20	47100	7.05	19300	4.90	8780	3.50	4620	4.80	8380	2.00	1600	2.25	2000	2.15	1840	6.65	17000	6.20	14800	5.20	10100
24, ...	13.50	64900	9.05	32000	7.20	20200	4.70	7980	3.30	4160	6.10	14300	1.95	1540	2.20	1920	2.60	2640	7.30	20800	6.05	14000	5.60	11900
25, ...	12.55	57200	8.60	29000	20.05	129000	4.60	7600	3.10	3720	6.90	18400	1.90	1460	2.10	1760	2.75	2960	9.90	37900	5.85	13100	5.60	11900
26, ...	11.60	50000	9.75	36800	b29.55	253000	5.05	9420	4.60	7600	7.00	19000	1.85	1400	2.00	1600	2.70	2850	11.30	47900	5.70	12400	5.50	11400
27, ...	11.10	46400	11.80	51500	29.15	247000	6.20	14800	6.10	14300	6.50	16200	1.85	1400	1.90	1460	2.60	2640	10.40	41400	5.50	11400	5.25	10300
28, ...	9.60	35800	12.25	54900	24.55	184000	8.10	25800	6.95	18700	6.15	14500	1.80	1340	1.85	1400	2.50	2440	9.65	36200	5.20	10100	5.10	9640
29, ...	9.80	37200	......	......	18.95	117000	9.90	37900	7.10	19600	5.70	12400	1.95	1540	1.80	1340	2.60	2640	8.80	30400	5.05	9420	4.90	8780
30, ...	9.20	33000	......	......	16.48	91500	11.45	49000	6.90	18400	5.15	9860	2.10	1760	1.70	1220	2.50	2440	8.10	25800	4.90	8780	4.85	8580
31, ...	8.50	28400	......	......	14.10	70000	......	......	6.40	15800	....	......	2.10	1760	1.60	1100	....	....	7.25	20500	......	......	4.80	8380

aMax. 25.3′ at 1:00 a. m.; 194000 sec. ft. bMax. 30.7′ at 4 p. m.; 269000 sec. ft. *Estimated.

ESTIMATED MONTHLY DISCHARGE OF ALLEGHENY RIVER, AT KITTANNING, ARMSTRONG COUNTY, PA.

(Drainage area 9010 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	194000	22000	62100	6.892	7.945
February,	54900	6950	17500	1.942	2.022
March,	269000	9640	56300	6.249	7.205
April,	55300	7600	22000	2.442	2.724
May,	45000	3720	12800	1.421	1.638
June,	19000	2540	8140	0.903	1.007
July,	10300	1340	3870	0.430	0.496
August,	2260	1100	1560	0.173	0.200
September,	2960	*570	1310	0.145	0.162
October,	47900	1400	11400	1.265	1.458
November,	61600	4850	19900	2.209	2.465
December,	15800	6380	9940	1.103	1.272
The year,	269000	*570	18900	2.098	28.594

*Estimated.

CROOKED CREEK.

DESCRIPTION OF BASIN.

Crooked creek, a tributary of the Allegheny river in Armstrong county, drains approximately 290 square miles. Rising in numerous branches in the west central part of Indiana county, it follows first a general southwesterly course through a coal mining and farming region to the Indiana-Armstrong county line, and then turns northwest through a sparsely settled farming region to its mouth at Rosstown, a total distance of approximately 54 miles.

This basin is largely deforested, and in some sections the hillsides are bare. The elevation of the source of Crooked creek is about 1,400 feet, and of the mouth 786 feet. Near the headwaters the slope is steep, averaging in seven and one-half miles about 40 feet per mile, while below this point to its mouth, a distance of approximately 46 miles, the rate of fall is uniform, at the rate of 7 feet per mile. The principal tributaries are Plum and Cherry creeks. This creek flows in a broad valley, which lies about 300 to 400 feet below the elevation of the adjacent hills, the bottom is stony and the stream tortuous in its course.

Numerous farming and coal mining villages lie in this drainage area, and some of these obtain water supplies from the stream or its tributaries. The stream proper is badly polluted by effluents from coal washing at the mines.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since October 16, 1909, at Hileman's Farm, approximately 3 miles above the mouth.

OHIO BASIN--STATION NO. 14.

CROOKED CREEK AT HILEMAN'S FARM, PA.

DESCRIPTION OF STATION.

LOCATION—On single span steel, through-truss highway bridge at Hileman's Farm, Armstrong county, about three miles above the mouth.

RECORDS AVAILABLE—Discharge complete from October 16, 1909, to December 31, 1913.

DRAINAGE AREA—279 square miles.

GAGE—A standard chain gage is fastened to the upstream handrail near the right bank. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 22.70 feet. Bench Mark No. 1 is on top of stone in upstream face or wing of right abutment, two inches from right end of stone; stone is seventh course down from bridge seat, and eighth stone in from face, six feet, more or less, down from top of wall; elevation 12.95 feet above gage datum. The gage is read twice daily by J. T. Hileman.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, by wading at low stages. The initial point for sounding is top edge of bridge seat, right abutment.

CHANNEL—The channel above and below the station is straight for 800 feet and 500 feet respectively. Both banks are high and not subject to overflow. The bed is composed of rocks, the section deep, with slight velocity at low stages.

DISCHARGE MEASUREMENTS OF CROOKED CREEK, AT HILEMANS FARM, ARMSTRONG COUNTY, PA.

(Drainage area 279 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
14	Aug. 22	Boehringer, ...	53	29	0.72	1.19	21	Wading measurement.

DISCHARGE TABLE FOR CROOKED CREEK, AT HILEMANS FARM, ARMSTRONG COUNTY, FROM OCT. 16, 1909.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.50	2	.60	359	.70	2180	.80	4770	.90	8700
.60	2	.70	403	.80	2300	.90	4920	9.00	8900
.70	2	.80	451	.90	2420	7.00	5070	.10	9100
.80	3	.90	500	5.00	2530	.10	5230	.20	9300
.90	5	3.00	555	.10	2640	.20	5390	.30	9500
1.00	7	.10	620	.20	2750	.30	5560	.40	9700
.10	11	.20	690	.30	2860	.40	5730	.50	9900
.20	18	.30	770	.40	2980	.50	5910	.60	10100
.30	26	.40	850	.50	3090	.60	6100	.70	10300
.40	36	.50	940	.60	3200	.70	6300	.80	10500
.50	48	.60	1030	.70	3320	.80	6500	.90	10700
.60	61	.70	1120	.80	3440	.90	6700	10.00	10900
.70	77	.80	1220	.90	3560	8.00	6900	.10	11100
.80	97	.90	1320	6.00	3680	.10	7100	.20	11300
.90	120	4.00	1420	.10	3810	.20	7300	.30	11500
2.00	145	.10	1520	.20	3940	.30	7500	.40	11700
.10	174	.20	1630	.30	4070	.40	7700	.50	11900
.20	205	.30	1740	.40	4200	.50	7900	.60	12100
.30	240	.40	1850	.50	4340	.60	8100		
.40	278	.50	1960	.60	4480	.70	8300		
.50	318	.60	2070	.70	4620	.80	8500		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF CROOKED CREEK, AT HILEMANS FARM, ARMSTRONG CO., PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	4.30	1740	3.05	588	5.91	3570	2.86	480	2.60	359	2.40	278	1.40	36	1.65	69	0.96	6	1.24	21	2.12	180	2.30	240
2,	3.45	895	2.75	427	4.46	1920	2.51	322	2.50	318	2.15	190	1.40	36	1.55	54	1.36	32	2.14	14	2.12	180	2.20	205
3,	4.65	2120	2.55	338	3.81	1230	2.46	302	2.40	278	1.95	132	1.35	31	1.40	36	1.26	23	3.34	802	2.02	151	2.20	205
4,	4.80	2300	2.40	278	3.51	949	2.50	318	2.35	259	1.75	87	1.60	61	2.65	381	1.21	19	2.84	471	1.92	125	2.20	205
5,	3.70	1120	2.10	174	3.11	627	2.60	359	2.30	240	1.70	77	1.40	36	2.60	359	1.16	15	2.74	422	1.87	113	2.50	318
6,	5.05	2580	2.00	145	3.16	662	2.55	338	2.20	205	1.65	69	1.40	36	1.95	132	1.16	15	2.49	314	1.77	91	3.60	1030
7,	7.00	5070	1.85	108	2.81	456	2.35	259	2.20	205	1.60	61	1.40	36	1.35	31	0.96	6	2.34	255	2.02	151	3.50	940
8,	a8.95	8800	1.90	120	2.26	226	2.30	240	2.10	174	1.55	54	1.30	26	1.20	18	1.46	43	2.29	236	1.97	138	3.15	655
9,	6.95	5000	1.80	97	2.26	226	2.05	160	2.00	145	1.50	48	1.30	26	1.10	11	1.46	43	2.49	314	2.27	230	2.90	500
10,	5.10	2640	1.65	69	2.11	177	2.00	145	2.00	145	1.30	26	1.20	18	0.90	5	1.36	32	2.74	422	3.67	1090	2.65	381
11,	6.00	3680	*	60	2.46	302	2.10	174	1.90	120	1.40	36	1.40	36	1.60	61	1.36	32	2.49	314	3.87	1290	2.50	318
12,	5.30	2860	......	60	2.11	177	2.50	318	1.90	120	1.30	26	1.70	77	1.60	61	1.26	23	2.44	294	3.07	600	2.40	278
13,	4.05	1470	......	60	3.76	1180	2.40	278	1.80	97	1.30	26	1.55	54	1.50	48	1.26	23	2.39	274	2.82	461	2.40	278
14,	3.45	895	......	60	2.91	506	2.40	278	1.80	97	1.30	26	1.50	48	1.35	31	1.26	23	2.29	236	2.87	485	2.40	278
15,	3.10	620	......	60	2.51	322	2.35	259	1.95	132	1.20	18	1.40	36	1.20	18	1.26	23	2.24	219	3.77	1190	2.35	259
16,	3.85	1270	......	60	2.26	226	2.20	205	1.90	120	1.10	11	1.70	77	1.20	18	1.26	23	2.14	186	3.62	1050	2.25	222
17,	4.75	2240	......	60	2.11	177	2.05	160	1.80	97	1.00	7	1.75	87	1.10	11	1.26	23	2.04	157	3.47	913	2.20	205
18,	6.45	4270	......	60	2.06	162	2.00	145	1.80	97	1.00	7	1.60	61	1.20	18	1.26	23	2.74	422	3.37	826	2.20	205
19,	5.55	3140	......	100	2.06	162	1.90	120	1.80	97	1.15	14	1.55	54	1.55	54	1.76	89	3.04	581	3.17	669	2.20	205
20,	5.20	2750	......	250	1.91	122	1.80	97	1.70	77	1.30	26	1.40	36	1.30	26	1.81	99	3.04	581	2.92	511	2.20	205
21,	4.40	1850	......	450	1.76	89	1.80	97	1.75	87	1.50	48	1.40	36	1.30	26	1.76	89	2.89	495	2.82	461	2.25	222
22,	5.15	2700	......	600	1.76	89	1.80	97	1.90	120	1.40	36	1.30	26	1.25	22	1.76	89	2.74	422	2.72	413	2.40	278
23,	6.75	4700	4.60	2070	2.11	177	1.80	97	1.90	120	1.35	31	1.30	26	1.20	18	1.61	63	2.74	422	2.62	368	2.30	240
24,	5.75	3380	4.10	1520	3.16	662	1.70	77	......	†120	1.25	22	1.20	18	1.20	18	1.51	49	3.14	648	2.47	306	2.20	205
25,	4.35	1800	4.25	1680	4.31	1750	1.65	69	......	†200	1.20	18	1.65	69	1.10	11	1.36	32	3.54	976	2.37	267	2.20	205
26,	3.60	1030	3.65	1080	b10.01	10900	1.65	69	......	†200	1.30	26	1.75	87	1.20	18	1.36	32	3.54	976	2.32	248	2.30	240
27,	3.15	655	5.15	2700	9.81	10500	2.20	205	5.40	2980	1.55	54	1.60	61	1.40	36	1.31	27	3.34	802	2.37	267	2.25	222
28,	2.80	451	6.90	4920	7.71	6320	2.40	278	4.20	1630	1.60	61	1.60	61	1.30	26	1.26	23	3.14	648	2.47	306	2.30	240
29,	3.00	555	......	....	5.56	3160	2.45	298	3.30	770	1.60	61	1.75	87	1.20	18	1.26	23	2.94	522	2.37	267	2.30	240
30,	3.05	588	......	....	3.61	1040	2.65	381	2.80	451	1.40	36	2.10	174	1.05	9	1.26	23	2.79	446	2.32	248	2.30	240
31,	3.25	730	......	....	3.16	662	......	....	2.60	359	......	....	1.95	132	1.00	7	......	....	2.39	274	......	....	2.20	205

Notes.—aMax. 9.75′ at 5:00 p. m.; 10400 sec. ft. bMax. 11.01′ at 5:30 p. m.; 12900 sec. ft. *Creek frozen Feb. 11-22 inclusive, and discharge estimated from climatological records. †Estimated.

ESTIMATED MONTHLY DISCHARGE OF CROOKED CREEK, AT HILEMAN'S FARM, ARMSTRONG COUNTY, PA.

(Drainage area 279 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	10400	451	2380	8.530	9.834
February,	4920	....	650	2.330	2.426
March,	12900	89	1570	5.627	6.487
April,	480	69	221	0.792	0.884
May,	2980	77	336	1.204	1.388
June,	278	7	54	0.193	0.215
July,	174	18	54	0.193	0.222
August,	381	5	53	0.190	0.219
September,	99	6	36	0.129	0.144
October,	976	14	425	1.523	1.756
November,	1290	91	453	1.624	1.812
December,	1030	205	312	1.118	1.289
The year,	12900	5	545	1.954	26.676

Note.—Creek frozen Feb. 11-22, inclusive, and discharge estimated from climatological records.

BLACKLICK CREEK.

DESCRIPTION OF BASIN.

Blacklick creek, one of the largest of the tributaries of the Conemaugh river, is formed by the junction of the North and South Branches on the line between Indiana and Cambria counties at Vintondale. It thence flows westerly through the southern part of Indiana county for about 26 miles to its mouth near Blairsville. The total drainage area tributary above its mouth is 412 square miles. The North Branch rises in the southwestern part of Carroll township, at an elevation of 2,000 feet, and is 16 miles long, draining 70 square miles, and the latter rises in the northern part of Cambria township and is approximately the same length, draining 48 square miles.

In its extreme upper portion the North Branch flows through a steep mountainous country, while the lower portion contains more cleared land, is more inhabited and the hills are lower and less steep. The watershed of the South Branch is similar but is more inhabited and includes considerable bituminous coal, which is being actively mined.

The valley of the main creek is rather broad, with numerous wide flat areas, similar to the one at its junction with its chief tributary, Two Lick creek, at Josephine. The rounded hills, which rise some 400 to 500 feet on either side are often wooded.

Below the forks of the North and South Branches and extending to its mouth and up Two Lick creek, is an extensive bituminous coal field. The main valleys are largely under cultivation, but numerous tributaries drain areas densely covered with second growth.

The slope between the forks and mouth is 18.3 feet per mile, quite sluggish at some points and exceedingly rapid at others.

The North and South Branches, Two Lick creek and certain other tributaries are all used for domestic and industrial supply, while the use of water from the main stream and the tributaries by coal mines, steel works, etc., is extensive.

The mean annual precipitation over this watershed is from 40 to 50 inches.

The discharge has been measured since August 16, 1904, at Blacklick, just below the mouth of Two Lick creek.

OHIO BASIN—STATION NO. 15.

BLACKLICK CREEK AT BLACKLICK, PA.

DESCRIPTION OF STATION.

LOCATION—On 3 span, steel, through-truss highway bridge, one-quarter mile from railroad station at Blacklick, Indiana county, Pa.

RECORDS AVAILABLE—Discharge complete from August 16, 1904, to July 15, 1906, and from January 8, 1907, to December 31, 1913.

DRAINAGE AREA—386 square miles.

GAGE—A standard chain gage is attached to the upstream hand-rail of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 20.16 feet. Bench Mark No. 1 is a nail in first maple tree from door of Maynard's House, one foot above ground, driven horizontally, and bent over one inch from head; elevation 13.92 feet above gage datum. Bench Mark No. 2 is heads of four spikes driven into the root of large maple 45 feet from edge of low water and about 190 feet upstream from bridge; elevation 12.96 feet above gage datum. Bench Mark No. 3 is upper edge of horizontal cross-plate at elevation of guard-rails on upstream side of bridge, 4.3 feet from initial point for soundings; elevation 14.43 feet above gage datum. The gage is read twice daily by D. J. Walling.

DISCHARGE MEASUREMENTS—Taken from the upstream side of the bridge at ordinary stages; from coal tipple one-quarter mile above bridge at high stages; by wading above bridge at lowest stages. The initial point for soundings is the first angle post in upstream handrail at left bank. Stations painted on wheel guard every ten feet.

CHANNEL—The channel above and below the station is straight for 2,000 feet and 250 feet respectively. The right bank is high and not subject to overflow. The left bank is subject to overflow above gage height 11.5 feet. The bed is composed of gravel, sand, and boulders.

REMARKS—Two Lick Creek comes in about three-fourths of a mile above the bridge.

DISCHARGE MEASUREMENTS OF BLACKLICK CREEK, AT BLACKLICK, INDIANA COUNTY, PA.

(Drainage area 386 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
27	Aug. 16	Boehringer, ...	63	51	0.73	2.16	37	0.6 measurement.

DISCHARGE TABLE FOR BLACKLICK CREEK, AT BLACKLICK, INDIANA COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.90	8	.20	1140	.50	4455	.80	9320	.10	15210
2.00	21	.30	1230	.60	4655	.90	9540	.20	15500
.10	38	.40	1320	.70	4855	9.00	9760	.30	15795
.20	59	.50	1420	.80	5060	.10	9990	.40	16090
.30	83	.60	1520	.90	5270	.20	10220	.50	16390
.40	110	.70	1620	7.00	5480	.30	10460	.60	16690
.50	140	.80	1730	.10	5690	.40	10700	.70	16995
.60	172	.90	1845	.20	5900	.50	10950	.80	17300
.70	205	5.00	1960	.30	6110	.60	11200	.90	17610
.80	240	.10	2090	.40	6320	.70	11450	12.00	17920
.90	280	.20	2230	.50	6530	.80	11700	.10	18235
3.00	320	.30	2375	.60	6740	.90	11950	.20	18550
.10	365	.40	2525	.70	6950	10.00	12200	.30	18895
.20	415	.50	2680	.80	7160	.10	12460	.40	19240
.30	470	.60	2840	.90	7370	.20	12720	.50	19585
.40	525	.70	3000	8.00	7580	.30	12985	.60	19930
.50	590	.80	3165	.10	7790	.40	13250	.70	20285
.60	660	.90	3335	.20	8000	.50	13525	.80	20640
.70	730	6.00	3510	.30	8220	.60	13800	.90	21020
.80	805	.10	3690	.40	8440	.70	14080	13.00	21400
.90	885	.20	3875	.50	8660	.80	14360		
4.00	965	.30	4060	.60	8880	.90	14640		
.10	1050	.40	4255	.70	9100	11.00	14920		

Note.—This table is only applicable subsequent to Jan. 1, 1912, and is based on five discharge measurements made during 1912 and 1913, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF BLACKLICK CREEK, AT BLACKLICK, INDIANA COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	4.50	1420	3.81	813	4.90	1840	4.00	965	3.63	681	4.02	982	2.50	140	2.26	73	2.08	35	2.73	216	3.53	611	3.18	405
2, ...	4.03	990	3.38	514	4.56	1480	3.74	760	3.37	508	3.72	745	2.46	128	2.22	64	2.05	30	3.68	716	3.28	459	3.16	395
3, ...	6.21	3890	3.48	577	4.20	1140	3.66	702	3.23	432	3.45	558	2.42	116	2.17	53	2.07	33	4.95	1900	3.20	415	3.12	375
4, ...	6.14	3760	3.40	525	3.95	925	3.50	590	3.12	375	3.29	464	2.38	105	2.14	46	2.03	26	3.69	723	3.08	356	3.09	360
5, ...	5.85	3250	3.17	400	4.16	1100	3.40	525	3.05	342	3.15	390	2.50	140	2.12	42	2.01	23	3.03	334	3.06	347	3.04	338
6, ...	5.53	2730	3.23	432	3.87	861	3.29	464	2.97	308	3.05	342	2.52	146	2.08	35	2.03	26	2.48	134	2.96	304	3.02	329
7, ...	7.51	6550	3.22	426	3.32	481	3.20	415	3.01	325	2.97	308	2.42	116	3.49	584	2.09	36	2.70	205	2.88	272	3.56	632
8, ...	a9.81	11700	3.24	437	3.36	503	3.10	365	2.88	272	2.98	312	2.34	94	3.30	470	2.30	83	2.59	169	2.92	288	4.64	1560
9, ...	6.68	4820	3.18	405	3.61	667	3.02	329	2.80	240	2.83	252	2.36	99	2.96	304	2.27	76	2.53	150	3.76	775	4.06	1020
10, ...	5.32	2400	3.07	352	3.86	853	2.97	308	2.75	222	2.69	202	2.41	113	2.57	162	2.17	53	2.45	125	6.24	3950	3.84	837
11, ...	7.35	6220	3.08	356	4.44	1360	3.06	347	2.70	205	2.58	166	2.48	134	2.50	140	2.13	44	2.55	156	4.87	1810	3.70	730
12, ...	8.78	9280	3.10	365	4.24	1180	3.41	532	2.67	195	2.57	162	2.38	105	2.41	113	2.10	38	2.60	172	4.38	1300	3.44	551
13, ...	6.40	4260	3.05	342	4.05	1010	3.24	437	2.63	182	2.57	162	2.32	88	2.32	88	2.07	33	2.57	162	4.85	1790	3.39	520
14, ...	5.16	2170	3.13	380	4.58	1500	3.27	454	2.59	169	2.52	146	2.31	86	2.27	76	2.05	30	2.49	137	5.55	2760	3.34	492
15, ...	4.56	1480	3.04	338	4.49	1410	3.33	486	2.68	198	2.49	137	2.32	88	2.22	64	2.05	30	2.39	107	5.06	2040	3.32	481
16, ...	4.60	1520	2.92	288	4.15	1100	3.30	470	3.21	420	2.45	125	2.28	78	2.16	51	2.05	30	2.35	96	5.04	2010	3.16	395
17, ...	5.92	3370	2.87	268	3.84	837	3.17	400	3.26	448	2.41	113	2.28	78	2.16	51	2.14	46	2.35	96	4.69	1610	3.16	395
18, ...	5.82	3200	2.81	244	3.60	660	3.06	347	2.97	308	2.29	81	2.75	222	2.30	83	2.25	71	2.39	107	4.22	1160	3.14	385
19, ...	5.40	2520	2.85	260	3.55	625	3.04	338	2.87	268	2.11	40	2.50	140	2.29	81	2.29	81	2.45	125	3.97	941	3.05	342
20, ...	4.83	1760	3.12	375	3.48	577	2.96	304	2.84	256	2.51	143	2.34	94	2.22	64	2.23	66	4.13	1080	3.66	702	2.92	288
21, ...	5.10	2090	3.53	611	3.44	551	2.87	268	2.79	236	2.68	198	2.27	76	2.18	55	2.51	143	3.75	768	3.57	639	3.07	352
22, ...	4.70	1620	4.71	1630	3.35	498	2.82	248	3.45	558	2.64	185	2.20	59	2.16	51	2.73	216	3.41	532	3.58	646	2.96	304
23, ...	5.32	2400	4.80	1730	3.20	415	2.83	252	4.67	1590	2.50	140	2.11	40	2.17	53	2.52	146	3.11	370	3.35	498	3.05	342
24, ...	6.08	3650	3.78	790	3.18	405	2.78	233	3.90	885	2.45	125	2.18	55	2.15	48	2.35	96	3.33	486	3.23	432	3.58	646
25, ...	5.14	2150	3.51	597	3.34	492	2.76	226	3.74	760	2.47	131	2.43	119	2.13	44	2.25	71	4.17	1110	3.17	400	3.60	660
26, ...	4.62	1540	3.36	503	5.64	2900	2.76	226	3.85	845	2.49	137	2.39	107	2.13	44	2.23	66	6.31	4080	3.03	334	3.94	917
27, ...	4.26	1190	4.12	1070	b8.13	7850	3.34	492	c9.76	11600	3.39	520	2.26	73	2.08	35	2.15	48	4.86	1800	2.99	316	3.45	558
28, ...	3.98	949	5.97	3460	6.20	3875	3.65	695	6.67	4800	2.95	300	2.30	83	2.06	31	2.13	44	4.31	1240	3.01	325	3.24	437
29, ...	3.74	760	......	....	5.07	2050	4.28	1210	5.25	2300	2.91	284	2.70	205	2.07	33	2.09	36	3.93	909	3.24	437	3.44	551
30, ...	3.58	646	......	....	4.52	1440	3.80	805	4.61	1530	2.71	208	2.72	212	2.15	48	2.07	33	3.71	738	3.34	492	3.14	385
31, ...	3.64	688	......	....	4.22	1160	......	....	4.57	1490	....	......	2.39	107	2.13	44	......	....	3.73	752	......	....	3.20	415

Notes.—aMax. 10.5′ at 3 p. m.; 13500 sec. ft. bMax. 8.7′ at 2 p. m.; 9100 sec ft. cMax. 10.41′ at 11 a. m.; 13300 sec. ft.

ESTIMATED MONTHLY DISCHARGE OF BLACKLICK CREEK, AT BLACKLICK, INDIANA COUNTY, PA.

(Drainage area 386 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	13500	646	3060	7.927	9.139
February,	3460	244	660	1.710	1.781
March,	9100	405	1350	3.497	4.032
April,	1210	226	473	1.225	1.366
May,	13300	169	1060	2.746	3.166
June,	982	40	269	0.697	0.778
July,	222	40	111	0.288	0.332
August,	584	31	101	0.262	0.302
September,	216	23	60	0.155	0.173
October,	4080	96	635	1.645	1.896
November,	3950	272	947	2.453	2.737
December,	1560	288	529	1.370	1.579
The year,	13500	23	771	1.998	27.281

LOYALHANNA CREEK.

DESCRIPTION OF BASIN.

Loyalhanna creek, an important tributary of the Kiskiminetas river, draining an area of approximately 300 square miles, rises in the southern part of Westmoreland county, Pa., and flows in a northerly direction, for a distance of about 45 miles, to its mouth, at the junction of the Conemaugh and Kiskiminetas rivers. In the upper watershed it flows through a narrow valley between Chestnut and Laurel Ridges, the course being very circuitous, for a distance of about 15 miles, at which point it breaks through Chestnut Ridge into a succession of wide, flat, bottom lands, well populated by a coal mining and agricultural community, the hills becoming low and rolling. The fall of the creek, from the foot of Chestnut Ridge to its mouth, a distance of approximately 27 miles, is rather uniform at the rate of about six feet per mile. In the gap through Chestnut Ridge the creek falls 100 feet in a distance of four miles, or at the rate of 25 feet per mile. There are numerous large tributaries at the headwaters of this stream, but in its lower reaches they become much smaller and are of little importance. The stream is polluted by mine waste from Chestnut Ridge to its mouth. There are numerous towns in this watershed, the largest of which are Latrobe and Ligonier.

Loyalhanna creek and several of its tributaries are used for commercial and industrial water supply purposes.

The mean annual precipitation over the upper watershed is from 45 to 50 inches, while the lower portion is from 35 to 45 inches.

The discharge was measured from October 7, 1910 to August 17, 1913 below New Alexandria, and since August 17, 1913, at New Alexandria.

OHIO BASIN—STATION NO. 16.

LOYALHANNA CREEK BELOW NEW ALEXANDRIA, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge, below New Alexandria, Westmoreland county.

RECORDS AVAILABLE—Discharge complete from October 7, 1910, to January 31, 1912; April 24 to June 17, 1912, and August 1, 1912 to August 14, 1913.

DRAINAGE AREA—270 square miles.

GAGE—A chain gage staff was nailed to the floor of the bridge, 87 feet from initial point for soundings. The elevation of zero is 909.34 feet above mean sea level. The length of chain from the bottom of the weight to the marker was 24.11 feet. Bench Mark No. 1 is bridge seat, west side of north abutment, first highway bridge below New Alexandria; elevation 932.89 feet above mean sea level. The gage was read once daily by Frank Hollis.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading during low stages. The initial point for soundings is the top edge of left abutment, 1.8 feet from end of handrail, downstream side of bridge.

CHANNEL—The channel above and below the station is straight for 100 feet and 1,000 feet respectively. The right bank is high and not subject to overflow. The left bank overflows at about 10 feet stage. The bed is composed of rock and gravel.

REMARKS—This station was discontinued on August 17, 1913, and re-established at New Alexandria on the same date.

DISCHARGE TABLE FOR LOYALHANNA CREEK, BELOW NEW ALEXANDRIA, WESTMORELAND COUNTY, FROM JAN. 1, 1912 TO AUG. 17, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.50	33	.70	400	.90	1145	.10	2100	.30	3315
.60	52	.80	445	4.00	1220	.20	2190	.40	3430
.70	72	.90	497	.10	1295	.30	2280	.50	3545
.80	95	3.00	550	.20	1370	.40	2375	.60	3660
.90	120	.10	605	.30	1445	.50	2470	.70	3775
2.00	145	.20	665	.40	1525	.60	2570	.80	3890
.10	175	.30	725	.50	1605	.70	2670	.90	4010
.20	205	.40	790	.60	1685	.80	2770	7.00	4130
.30	238	.50	860	.70	1765	.90	2875		
.40	272	.60	930	.80	1845	6.00	2980		
.50	312	.70	1000	.90	1930	.10	3090		
.60	355	.80	1070	5.00	2015	.20	3200		

Note.—This table is only applicable subsequent to Jan. 1, 1912, and is based on seven discharge measurements made during 1912-1913, together with former curve.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF LOYALHANNA CREEK, BELOW NEW ALEXANDRIA, WESTMORELAND COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.3	725	2.5	312	3.7	1000	2.3	238	2.35	255	2.25	222	2.25	222	1.94	130
2,	3.0	550	2.5	312	3.0	550	2.3	238	2.30	238	2.25	222	2.25	222	2.24	218
3,	3.7	1000	2.6	355	2.9	497	2.9	497	2.25	222	2.25	222	2.25	222	2.34	252
4,	4.1	1300	2.8	445	3.0	550	2.8	445	2.30	238	2.35	255	2.25	222	2.24	218
5,	3.4	790	2.5	312	3.2	665	2.6	355	2.35	255	2.40	272	2.35	255	2.24	218
6,	......	‡2000	2.5	312	2.9	497	2.6	355	2.35	255	2.35	255	2.55	334	2.24	218
7,	6.3	3320	3.3	725	2.5	312	2.5	312	......	†249	2.35	255	2.25	222	2.24	218
8,	10.7	8720	3.6	930	......	†404	2.3	238	......	†244	2.25	222	2.25	222	2.34	252
9,	4.8	1840	3.2	665	2.9	497	2.3	238	2.30	238	2.25	222	1.95	132	2.34	252
10,	4.2	1370	3.0	550	2.9	497	2.2	205	2.25	222	2.30	238	2.35	255	2.24	218
11,	5.3	2280	3.0	550	2.5	312	2.3	238	2.25	222	2.35	255	2.25	222	2.24	218
12,	8.8	6320	2.9	497	3.3	725	2.3	238	2.40	272	2.25	222	1.95	132	2.34	252
13,	5.3	2280	2.8	445	3.2	665	2.6	355	2.35	255	2.35	255	1.95	132	2.24	218
14,	4.1	1300	3.1	605	3.2	665	2.6	355	2.40	272	2.35	255	2.25	222	*2.24	218
15,	3.5	860	3.0	550	3.2	665	2.5	312	2.25	222	2.40	272	2.25	222	......	.....
16,	3.5	860	3.0	550	3.0	550	2.6	355	3.15	635	2.25	222	2.25	222	......	.....
17,	3.8	1070	2.9	497	3.0	550	2.3	238	2.30	238	2.25	222	2.25	222	......	.....
18,	4.2	1370	2.9	497	2.3	238	2.3	238	2.25	222	2.25	222	1.95	132	......	.....
19,	3.8	1070	2.9	497	2.3	238	2.6	355	2.30	238	2.25	222	1.95	132	......	.....
20,	3.5	860	3.1	605	1.9	120	2.3	238	2.25	222	......	....	2.35	255	......	.....
21,	4.3	1440	3.0	550	2.0	145	2.4	272	2.25	222	......	....	2.25	222	......	.....
22,	4.3	1440	3.3	725	2.0	145	2.3	238	2.40	272	......	....	2.25	222	......	.....
23,	4.3	1440	3.4	790	2.3	238	2.3	238	2.45	292	......	....	2.25	222	......	.....
24,	4.9	1930	2.8	445	2.3	238	2.4	272	2.60	355	......	....	2.25	222	......	.....
25,	4.0	1220	2.5	312	2.3	238	2.3	238	2.45	292	......	....	2.25	222	......	.....
26,	3.5	860	3.0	550	4.6	1680	2.4	272	2.45	292	......	....	2.25	222	......	.....
27,	3.2	665	3.2	665	8.4	5810	2.3	238	2.60	355	......	....	2.35	255	......	.....
28,	3.0	550	4.7	1760	3.2	665	3.2	665	2.35	255	2.35	255	2.35	255	......	.....
29,	2.9	497	......	......	3.9	1140	2.4	272	2.40	272	2.35	255	2.35	255	......	.....
30,	2.9	497	......	......	3.3	725	2.3	238	2.35	255	1.95	132	1.95	132	......	.....
31,	2.5	312	......	......	2.3	238	......	....	2.30	238	2.25	222	1.95	132	......	.....

Note.‡Estimated. †Interpolated. *Station discontinued and re-established at New Alexandria on Aug. 17, 1913.

ESTIMATED MONTHLY DISCHARGE OF LOYALHANNA CREEK, BELOW NEW ALEXANDRIA, WESTMORELAND COUNTY, PA.

(Drainage area 270 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	8720	312	1640	6.074	7.003
February,	1760	312	572	2.119	2.207
March,	5810	120	692	2.563	2.955
April,	665	205	300	1.111	1.239
May,	635	222	268	0.993	1.145
July,	334	132	212	0.785	0.905

Station discontinued and re-established at New Alexandria August 17, 1913.

KISKIMINITAS RIVER.

DESCRIPTION OF BASIN.

The Kiskiminitas river is the largest tributary of the Allegheny, and joins it near Freeport, approximately 30 miles above Pittsburgh, in the northwestern corner of Westmoreland county. It is known by this name as far as the mouth of Loyalhanna creek, 27 miles up above which point it is called the Conemaugh river. The total drainage area of the stream is 1892 square miles.

The Conemaugh river proper is formed by the junction of the Little Conemaugh and Stony creek at Johnstown. The former rises in the western slope of the Alleghenies, on the eastern boundary of Cambria county, and flows northwesterly for about 30 miles to Johnstown. Stony creek rises in the high ridges of Somerset county, and flows northerly for about 40 miles to Johnstown. Both are rapid mountain streams, with steep slopes, rocky beds, and abrupt valleys. Their watersheds have been practically deforested, although the higher ridges are well timbered now with second growth. The watershed of Little Conemaugh river, including about 188 square miles, is densely inhabited, lying in the Cambria county bituminous coal field, and contains large areas of agricultural land. The Stony creek watershed is much less densely populated, although the Somerset county coal field, in the lower section, supports a large population. The upper watershed is sparsely inhabited, but little farmed, and contains considerable forest areas. The headwaters of both streams rise at an elevation of about 2,300 feet, and at Johnstown are at elevation 1,160 feet.

Below Johnstown the river follows a winding course in a general northwesterly direction, between precipitous banks and high timbered hillsides, and over a rocky bed, its slope to the mouth of Loyalhanna creek, 50 miles, being 6.8 feet per mile. From this latter point to the mouth at Freeport on the Allegheny river, the slope is at the rate of approximately 4 feet per mile.

The most important tributaries below Johnstown are Black Lick creek, drainage area approximately 412 square miles, from the north near Blairsville, and Loyalhanna creek, from the southeast. Both of these streams drain thickly populated and well cultivated areas, containing large bituminous coal fields.

The stream is lined with railroads, towns and industrial plants, while numerous coal mines are operated on the bordering hills and in the valleys of its tributaries.

The Kiskiminitas river carries vast quantities of alluvial material washed from its banks, and from the cultivated fields in its watershed, and is usually of a yellow color, due to this cause, and to the sulphur in the coal mine water of which it receives a considerable amount.

The tributaries of the Little Conemaugh above Johnstown are almost without exception used for water supply purposes, some of these containing large storage basins. At a point a short distance above Johnstown this stream has been known to be absolutely dry in seasons of drought. The lower tributaries of Stony creek, and the tributaries of the Conemaugh are similarly almost all in use for domestic or industrial supply. The main river is little used for domestic supply, but many large industrial plants use it.

The mean annual precipitation over this watershed is from 40 to 50 inches.

The discharge has been measured since May 29th, 1907, at Avonmore, approximately 24 miles above its mouth.

OHIO BASIN—STATION NO. 17.

KISKIMINITAS RIVER AT AVONMORE, PA.

DESCRIPTION OF STATION.

LOCATION—On highway bridge on road from P. R. R. Station, Avonmore, about one-fourth mile from village of Avonmore, Westmoreland county.

RECORDS AVAILABLE—Discharge complete from May 29, 1907 to December 31, 1913.

DRAINAGE AREA—1,720 square miles.

GAGE—A standard chain gage is attached to the downstream handrail. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 38.38 feet. Bench Mark No. 1 is northwest corner of right masonry bridge seat, marked "B. M.", elevation 33.267 feet above gage datum. Bench Mark No. 2 is east rail of west track of highway crossing; elevation 35.034 feet above gage datum. The gage is read twice daily by Ralph Fickes.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is left face of lower right masonry guard fence of approach to bridge.

CHANNEL—The channel above and below the station is straight for 400 feet and 300 feet respectively. The right bank is high and rocky, and the left bank is low and clean, and liable to overflow. The bed is composed of soft and sandy material.

DISCHARGE MEASUREMENTS OF KISKIMINITAS RIVER, AT AVONMORE, WESTMORELAND COUNTY, PA.

(Drainage area 1720 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
23	Aug. 16	Boehringer, ...	258	367	0.98	2.58	359	0.6 measurement.

DISCHARGE TABLE FOR KISKIMINITAS RIVER, AT AVONMORE, WESTMORELAND COUNTY, PA., FROM JAN. 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.50	45	.40	5140	.40	16680	.40	34510	.40	57600
.60	55	.50	5270	.50	16930	.50	34860	.50	58020
.70	70	.60	5400	.60	17180	.60	35210	.60	58440
.80	90	.70	5540	.70	17430	.70	35565	.70	58860
.90	115	.80	5680	.80	17680	.80	35920	.80	59280
2.00	145	.90	5820	.90	17935	.90	36275	.90	59700
.10	175	8.00	5960	14.00	18190	20.00	36630	26.00	60120
.20	205	.10	6110	.10	18445	.10	36985	.10	60540
.30	245	.20	6260	.20	18700	.20	37340	.20	60960
.40	285	.30	6410	.30	18955	.30	37700	.30	61380
.50	330	.40	6560	.40	19210	.40	38060	.40	61800
.60	375	.50	6710	.50	19470	.50	38425	.50	62220
.70	425	.60	6860	.60	19730	.60	38790	.60	62640
.80	480	.70	7010	.70	19990	.70	39155	.70	63060
.90	540	.80	7160	.80	20255	.80	39520	.80	63480
3.00	600	.90	7310	.90	20520	.90	39885	.90	63900
.10	665	9.00	7460	15.00	20790	21.00	40250	27.00	64320
.20	735	.10	7620	.10	21065	.10	40615	.10	64740
.30	805	.20	7780	.20	21345	.20	40980	.20	65160
.40	875	.30	7950	.30	21630	.30	41345	.30	65580
.50	945	.40	8120	.40	21920	.40	41710	.40	66000
.60	1015	.50	8290	.50	22210	.50	42075	.50	66420
.70	1090	.60	8460	.60	22500	.60	42440	.60	66840
.80	1165	.70	8630	.70	22790	.70	42805	.70	67260
.90	1245	.80	8800	.80	23080	.80	43175	.80	67680
4.00	1325	.90	8980	.90	23375	.90	43545	.90	68100
.10	1410	10.00	9170	16.00	23670	22.00	43920	28.00	68520
.20	1500	.10	9360	.10	23965	.10	44295	.10	68940
.30	1590	.20	9550	.20	24260	.20	44670	.20	69360
.40	1680	.30	9740	.30	24555	.30	45045	.30	69780
.50	1770	.40	9930	.40	24850	.40	45425	.40	70200
.60	1860	.50	10120	.50	25150	.50	45805	.50	70620
.70	1955	.60	10320	.60	25450	.60	46185	.60	71040
.80	2050	.70	10520	.70	25750	.70	46570	.70	71460
.90	2150	.80	10720	.80	26050	.80	46955	.80	71880
5.00	2250	.90	10920	.90	26355	.90	47340	.90	72300
.10	2355	11.00	11120	17.00	26660	23.00	47730	29.00	72720
.20	2465	.10	11330	.10	26965	.10	48120	.10	73140
.30	2575	.20	11540	.20	27270	.20	48510	.20	73560
.40	2685	.30	11750	.30	27575	.30	48905	.30	73985
.50	2800	.40	11970	.40	27885	.40	49305	.40	74410
.60	2915	.50	12190	.50	28195	.50	49705	.50	74835
.70	3030	.60	12410	.60	28510	.60	50110	.60	75260
.80	3145	.70	12630	.70	28830	.70	50515	.70	75690
.90	3260	.80	12860	.80	29150	.80	50925	.80	76120
6.00	3380	.90	13090	.90	29475	.90	51335	.90	76550
.10	3500	12.00	13320	18.00	29800	24.00	51750	30.00	76980
.20	3620	.10	13555	.10	30125	.10	52165	.10	77415
.30	3740	.20	13790	.20	30450	.20	52580	.20	77850
.40	3865	.30	14025	.30	30780	.30	52995	.30	78285
.50	3990	.40	14260	.40	31110	.40	53410	.40	78720
.60	4115	.50	14495	.50	31445	.50	53825	.50	79160
.70	4240	.60	14730	.60	31780	.60	54240	.60	79600
.80	4365	.70	14970	.70	32115	.70	54660	.70	80040
.90	4490	.80	15210	.80	32450	.80	55080	31.00	81360
7.00	4620	.90	15450	.90	32790	.90	55500	32.00	85760
.10	4750	13.00	15690	19.00	33130	25.00	55920		
.20	4880	.10	15935	.10	33475	.10	56340		
.30	5010	.20	16180	.20	33820	.20	56760		
		.30	16430	.30	34165	.30	57180		

Note.—This table is only applicable subsequent to Jan. 1, 1913, and is based on eleven discharge measurements made in 1912-13 and '14.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF KISKIMINITAS RIVER, AT AVONMORE, WESTMORELAND COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	7.93	5860	5.71	3040	8.95	7380	6.91	4500	5.16	2420	6.92	4520	3.04	626	2.97	582	2.40	285	3.24	763	5.44	2730	4.77	2020
2,	6.89	4480	5.03	2280	7.96	5900	6.15	3560	4.78	2030	6.00	3380	2.91	564	2.92	552	2.40	285	5.41	2700	5.01	2260	4.64	1900
3,	8.46	6650	4.86	2110	6.41	3880	5.89	3250	4.52	1790	5.47	2770	2.87	522	2.77	464	2.40	285	9.11	7640	4.71	1960	4.59	1850
4,	11.23	11600	5.76	3100	6.50	3990	6.07	3460	4.34	1630	5.00	2250	2.92	552	2.62	385	2.40	285	6.89	4480	4.54	1810	4.49	1760
5,	8.79	7140	6.83	4400	6.61	4130	5.53	2830	4.12	1430	4.60	1860	2.82	492	2.57	362	2.35	265	5.14	2400	4.41	1690	4.39	1670
6,	8.66	6950	*	1640	6.11	3510	5.26	2530	4.00	1320	4.27	1560	4.42	1700	2.54	348	2.30	245	4.29	1580	4.19	1490	4.31	1600
7,	14.39	19200	....	1640	5.19	2450	4.86	2110	3.92	1260	4.12	1430	3.57	994	2.62	385	2.30	245	3.81	1170	4.01	1330	4.64	1900
8,	a20.21	37400	....	1640	4.76	2010	4.69	1950	3.84	1200	4.22	1520	3.14	693	3.12	679	3.95	1280	3.49	938	3.89	1240	8.44	6620
9,	16.61	25500	....	1640	5.53	2830	4.46	1730	3.70	1090	3.92	1260	3.12	679	2.90	540	3.88	1230	3.31	812	4.79	2040	7.17	4840
10,	11.21	11600	....	1640	5.86	3210	4.29	1580	3.54	973	3.64	1040	3.44	903	2.74	447	3.05	632	3.14	693	d13.19	16200	6.24	3670
11,	11.59	12400	....	1640	6.71	4250	4.29	1580	3.40	875	3.50	945	3.67	1070	2.74	447	2.75	452	3.09	658	8.99	7440	5.94	3310
12,	18.43	31200	....	1640	7.57	5360	4.93	2180	3.32	819	3.37	854	3.22	749	2.92	552	2.62	385	3.14	693	7.69	5530	5.47	2770
13,	13.96	18100	....	1640	6.72	4260	5.01	2260	3.27	784	3.30	805	2.92	552	2.84	504	2.58	366	3.21	742	8.69	7000	5.21	2480
14,	10.53	10200	....	1640	7.12	4780	5.09	2340	3.24	763	3.22	749	2.82	492	2.70	425	2.50	330	3.14	693	11.77	12800	5.07	2320
15,	8.73	7060	....	1640	7.93	5860	5.37	2650	3.30	805	3.16	707	2.87	522	2.63	390	2.45	308	2.97	582	10.37	9870	4.99	2240
16,	8.30	6410	....	1640	7.21	4890	5.89	3250	4.54	1810	3.02	613	3.00	600	2.60	375	2.35	265	2.89	534	10.09	9340	4.84	2090
17,	9.75	8720	....	1640	6.40	3860	5.70	3030	4.54	1810	2.97	582	2.84	504	2.57	362	2.45	308	2.84	501	11.21	11600	4.67	1930
18,	10.35	9840	....	1640	5.81	3160	5.16	2420	4.04	1360	3.04	626	3.24	763	2.57	362	2.60	375	2.84	504	9.07	7570	4.57	1830
19,	10.13	9420	....	1640	5.47	2770	4.85	2100	3.68	1080	2.97	582	3.37	854	2.74	447	2.72	436	2.84	504	7.91	5830	4.41	1690
20,	8.83	7200	....	1640	5.29	2560	4.56	1820	3.50	945	3.00	600	3.02	613	2.62	385	2.72	436	4.31	1600	7.04	4670	4.17	1470
21,	9.15	7700	....	1640	5.29	2560	4.30	1590	3.36	847	3.27	784	2.82	492	2.60	375	3.05	632	6.94	4540	6.39	3850	4.04	1360
22,	8.42	6590	....	1640	5.16	2420	4.15	1460	3.45	910	3.44	903	2.74	447	2.50	330	3.95	1290	5.91	3270	5.81	3160	4.19	1490
23,	8.70	7010	7.71	5550	4.86	2110	4.06	1380	4.84	2090	3.27	784	2.77	464	3.04	626	4.02	1340	4.89	2140	5.39	2670	4.54	1810
24,	11.46	12100	6.16	3570	4.61	1870	3.97	1300	8.68	6980	3.02	613	2.72	436	2.80	480	3.35	840	4.71	1960	5.19	2450	6.41	3880
25,	9.79	8780	4.86	2110	4.66	1920	3.83	1190	7.14	4800	3.27	784	2.77	464	2.70	425	3.05	632	7.89	5810	4.84	2090	6.09	3490
26,	8.30	6410	4.90	2150	9.01	7480	3.75	1130	6.07	3460	3.30	805	2.82	492	2.60	375	2.82	492	13.44	16800	4.54	1810	8.17	6220
27,	7.51	5280	5.75	3090	b15.16	21200	3.85	1200	c14.27	18900	4.22	1520	2.76	458	2.54	348	2.72	436	10.87	10900	4.49	1760	7.04	4670
28,	7.01	4630	10.26	9660	12.87	15400	4.83	2080	13.47	16900	4.27	1560	2.62	385	2.52	339	2.62	385	8.27	6360	4.49	1760	5.94	3310
29,	6.55	4050	....	....	9.59	8440	5.96	3330	10.24	9630	3.72	1100	3.02	613	2.52	339	2.58	366	7.31	5020	4.61	1870	5.54	2850
30,	6.15	3560	....	....	8.06	6050	5.91	3270	8.20	6260	3.34	833	3.32	819	2.44	303	2.55	352	6.19	3610	4.99	2240	5.49	2790
31,	6.01	3390	....	....	7.21	4890	....	....	7.96	5900	....	......	3.17	714	2.42	294	......	....	5.84	3190	......	....	5.17	2430

Notes.—aMax. 22.21′ at 4:45 p. m.; 44700 sec. ft. bMax. 16.11′ at 4:45 p. m.; 24000 sec. ft. cMax. 18.47′ at 4:45 p. m.; 31300 sec. ft. dMax. 14.49′ at 8:30 a. m.; 19400 sec. ft. *River frozen Feb. 6-22 inclusive; discharge estimated from Blacklick Creek at Blacklick.

ESTIMATED MONTHLY DISCHARGE OF KISKIMINITAS RIVER, AT AVONMORE, WESTMORELAND COUNTY, PA.

(Drainage area 1720 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	44700	3390	10500	6.105	7.038
February,	9660	....	2460	1.430	1.489
March,	24000	1870	5010	2.913	3.358
April,	4500	1130	2300	1.337	1.492
May,	31300	763	3320	1.930	2.225
June,	4520	582	1280	0.744	0.830
July,	1700	385	653	0.380	0.438
August,	679	294	427	0.248	0.286
September,	1340	245	515	0.299	0.334
October,	16800	504	3030	1.762	2.031
November,	19400	1240	4600	2.674	2.983
December,	6620	1360	2720	1.581	1.823
The year,	44700	245	3070	1.784	24.327

Note.—River frozen February 6 to 22, inclusive, discharge estimated from Blacklick Creek at Blacklick.

WEST FORK RIVER.

DESCRIPTION OF BASIN.

The West Fork river rises in the western part of Upshur county, W. Va., and flows northwestward into Lewis county, thence flowing in a slight northeasterly direction to its junction with the Tygart river near Fairmount, W. Va.

Its length is approximately seventy miles and its drainage area, above the mouth, is about 845 square miles. The elevation of the hills at the source is about 1,500 feet, while at its mouth the elevation is about 860 feet. It flows through a broad valley, the bordering hills being steep and precipitous and slightly forested. There are no lakes, ponds or swamps on the drainage area. There are numerous tributaries, the largest of which are Ten Mile, creek, Simpson creek and Stone Coal creek. Its watershed is underlain by very valuable and extensive coal beds and contains oil and gas in abundance. There are several large towns in the drainage area, the most important of which are Clarksburg and Weston.

The mean annual precipitation over this watershed is between 45 and 50 inches.

The discharge has been measured since 1907, at Enterprise, W. Va., 33 miles above the mouth.

OHIO BASIN—STATION NO. 18.

WEST FORK RIVER AT ENTERPRISE, W. VA.

DESCRIPTION OF STATION.

LOCATION—On steel highway bridge at Enterprise, W. Va. about 12 miles above the mouth.

RECORDS AVAILABLE—Discharge complete from June 2, 1907 to September 30, 1913.

DRAINAGE AREA—750 square miles.

GAGE—A standard chain gage is attached to the bridge. The elevation of zero is 869.91 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 37.95 feet. Bench Mark No. 1 is northeast corner of left abutment, downstream side, elevation 33.70 feet above gage datum. Bench Mark No 2 is northwest corner, downstream end of pier, elevation 33.87 feet above gage datum. The gage is read by C. M. Tetrick.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading 200 feet above the bridge at low stages.

CHANNEL—The channel is broken by one pier. Both banks are high and not subject to overflow. The bed is composed of smooth rock.

REMARKS—A small dam is located at Worthington, W. Va., about 3 miles below the station, but backwater does not reach to the section. During the summer of 1908 the only water running in the river was the pumpage from the numerous coal mines along the stream. The following data have been furnished by the United States Geological Survey:

DISCHARGE MEASUREMENTS OF WEST FORK RIVER, AT ENTERPRISE, W. VA.

(Drainage area 750 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
19	March 28	Stevens, ...	219	1900	4.26	10.23	8100	0.2, 0.6 and 0.8 method.
20	Nov. 2	Peterson & Walters,.	134	191	0.81	1.82	154	0.2 and 0.8 method. Measurement 1300 feet below gage.

DISCHARGE TABLE FOR WEST FORK RIVER, AT ENTERPRISE, W. VA., FOM JUNE 2, 1907 TO SEPT. 30, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.00	0	.60	489	.20	2362	.80	5070	.40	8158
.10	1	.70	540	.30	2456	.90	5180	.50	8280
.20	2	.80	593	.40	2552	8.00	5290	.60	8404
.30	4	.90	649	.50	2650	.10	5400	.70	8528
.40	6	3.00	707	.60	2750	.20	5510	.80	8652
.50	9	.10	767	.70	2850	.30	5625	.90	8776
.60	12	.20	829	.80	2950	.40	5740	11.00	8900
.70	16	.30	893	.90	3050	.50	5855	.10	9025
.80	20	.40	959	6.00	3150	.60	5970	.20	9150
.90	25	.50	1026	.10	3252	.70	6085	.30	9275
1.00	30	.60	1094	.20	3356	.80	6200	.40	9400
.10	36	.70	1163	.30	3460	.90	6320	.50	9525
.20	43	.80	1233	.40	3564	9.00	6460	.60	9650
.30	52	.90	1304	.50	3670	.10	6580	.70	9775
.40	64	4.00	1377	.60	3776	.20	6700	.80	9900
.50	79	.10	1451	.70	3882	.30	6820	.90	10025
.60	99	.20	1526	.80	3988	.40	6940	12.00	10150
.70	124	.30	1602	.90	4094	.50	7060	13.00	11450
.80	155	.40	1680	7.00	4200	.60	7182	14.00	12750
.90	190	.50	1759	.10	4308	.70	7304	15.00	14100
2.00	227	.60	1840	.20	4416	.80	7426	16.00	15450
.10	266	.70	1922	.30	4524	.90	7548	16.40	16010
.20	307	.80	2006	.40	4632	10.00	7670	17.00	16850
.30	350	.90	2092	.50	4740	.10	7792		
.40	395	5.00	2180	.60	4850	.20	7914		
.50	441	.10	2270	.70	4960	.30	8036		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF WEST FORK RIVER, AT ENTERPRISE, W. VA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	5.2	2360	3.7	1160	3.25	861	3.1	767	2.3	350	5.2	2360	2.0	227	1.56	91	1.20	43
2,	3.7	1160	3.3	893	3.1	767	2.9	649	2.25	328	4.0	1380	1.90	190	1.52	83	1.20	43
3,	4.5	1760	3.25	861	3.1	767	2.7	540	2.2	307	3.4	959	1.80	155	1.50	79	1.15	40
4,	7.9	5180	8.5	5860	2.8	593	2.65	514	2.2	307	3.0	707	1.75	140	1.40	64	1.13	38
5,	6.1	3250	6.3	3460	3.2	829	2.45	418	2.1	266	2.85	621	1.70	124	1.35	58	1.10	36
6,	5.0	2180	4.7	1920	3.05	737	2.1	266	2.1	266	2.7	540	1.63	106	1.30	52	.90	25
7,	12.0	10200	3.6	1090	3.0	707	2.0	227	2.05	246	2.35	372	1.60	99	1.27	49	.80	20
8,	14.3	13200	3.7	1160	2.5	441	1.93	201	2.0	227	2.2	307	1.54	87	1.20	43	.80	20
9,	10.0	7670	3.7	1160	2.9	649	1.81	159	2.0	227	2.15	286	1.50	79	1.15	40	1.00	30
10,	6.0	3150	3.6	1090	3.0	707	1.70	124	1.87	180	2.1	266	7.5	4740	1.10	36	1.00	30
11,	4.0	1380	3.0	707	3.6	1090	2.5	441	1.80	155	1.00	30	5.1	2270	1.00	30	.80	20
12,	17.6	17700	8.4	5740	4.7	1920	2.95	678	1.70	124	1.93	201	3.3	893	1.00	30	.70	16
13,	14.5	13400	5.4	2550	4.5	1760	2.7	540	1.62	104	1.86	176	3.0	707	1.10	36	1.20	43
14,	8.4	5740	3.7	1160	4.9	2090	2.55	465	1.50	79	2.5	441	2.8	593	1.05	33	1.30	52
15,	4.4	1680	3.4	959	4.2	1530	2.3	350	1.50	79	1.78	149	2.5	441	1.00	30	1.30	52
16,	3.5	1030	3.1	767	4.0	1380	6.1	3250	1.40	64	1.72	130	2.25	328	1.90	190	1.30	52
17,	6.0	3150	3.0	707	4.3	1600	4.5	1760	3.7	1160	1.62	104	2.1	266	3.5	1030	1.40	64
18,	6.0	3150	2.9	649	3.35	926	3.4	959	3.3	893	1.60	99	2.1	266	2.8	593	1.45	72
19,	5.7	2850	2.8	593	3.0	707	3.1	767	3.0	707	1.51	81	2.2	307	2.4	395	1.57	93
20,	4.8	2010	2.75	566	2.75	566	2.9	649	2.6	489	1.45	72	2.2	307	2.2	307	1.50	79
21,	4.5	1760	2.75	566	2.6	489	2.7	540	2.4	395	1.40	64	2.05	246	2.1	266	1.50	79
22,	6.6	3780	2.65	514	2.4	395	2.65	514	2.2	307	1.30	52	1.90	190	2.0	227	1.50	79
23,	5.3	2460	2.6	489	2.2	307	2.45	418	12.4	10700	1.30	52	1.82	162	3.0	707	1.60	99
24,	7.0	4200	2.5	441	2.1	266	2.4	395	13.0	11400	1.25	48	1.73	133	2.4	395	1.50	79
25,	5.8	2950	2.4	395	2.05	247	2.2	307	7.7	4960	1.20	43	3.7	1160	2.15	286	1.60	99
26,	5.0	2180	2.4	395	3.0	707	2.1	266	4.3	1600	1.90	190	2.9	649	2.0	227	1.60	99
27,	4.5	1760	2.3	350	14.5	13400	2.1	266	8.2	5510	1.80	155	2.6	489	1.82	162	1.50	79
28,	4.1	1450	3.7	1160	11.8	9900	2.0	227	14.5	13400	1.85	172	2.2	307	1.70	124	1.50	79
29,	4.0	1380	......	......	5.8	2950	2.6	489	8.3	5620	1.80	155	1.75	140	1.50	79	1.40	64
30,	4.0	1380	......	......	4.4	1680	2.4	395	5.5	2650	1.70	124	1.68	119	1.40	64	1.40	64
31,	3.8	1230	......	......	3.7	1160	....	......	7.3	4520	....	......	1.60	99	1.30	52	....	......

ESTIMATED MONTHLY DISCHARGE OF WEST FORK RIVER, AT ENTERPRISE, W. VA.

(Drainage area 750 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	17700	1030	4090	5.45	6.28
February,	5860	350	1330	1.77	1.84
March,	13400	247	1680	2.24	2.58
April,	3250	124	585	.780	.87
May,	13400	64	2180	2.91	3.36
June,	2360	30	345	.460	.51
July,	4740	79	517	.689	.79
August,	1030	30	189	.252	.29
September,	99	16	56	.075	.08

TYGART RIVER.

DESCRIPTION OF BASIN.

The Tygart, also called Tygart's Valley river, rises in the southern part of Randolph county, W. Va., and flows in a general northerly direction to its junction with the West Fork river, near Fairmont, W. Va.

Its length is approximately one hundred miles while its drainage area, above the mouth, is approximately 1,420 square miles. The elevation of the hills at the source is approximately 3,500 feet, while at its mouth the elevation is about 860 feet. In the upper portions the country is mountainous, the slopes of the valleys steep and, in many places, precipitous and the fall of the stream is rapid. As the river approaches its confluence with the West Fork it flows through a rolling country. There are no lakes, ponds or swamps on the drainage area and the flow is flashy. There are many tributaries, the largest of which are Buchanan river and Middle Fork river. Its watershed is underlain by very valuable and extensive coal beds and contains oil and gas in abundance. At the headwaters there is still some timber, but over the general basin the mountains are sparsely forested. There are several large towns in the drainage basin, the most important of which are Grafton and Phillipi. Little water power has been developed although the main stream and its tributaries afford ample opportunity.

The mean annual precipitation over this watershed is from 45 to 50 inches.

The discharge has been measured since 1907, at Fetterman and Bellington, W. Va.

OHIO BASIN—STATION NO. 19.

TYGART RIVER AT FETTERMAN, W. VA.

DESCRIPTION OF STATION.

LOCATION—On iron highway bridge about 1,000 feet from the B. & O. Railroad Station, at Fetterman, W. Va., about 18 miles above the mouth.

RECORDS AVAILABLE—Discharge complete from June 3, 1907, to September 30, 1913.

DRAINAGE AREA—1,340 square miles.

GAGE—A chain gage is located on the left of the middle pier on the downstream side. The elevation of zero is 957.86 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 36.14 feet. Bench Mark No. 1 is southwest corner of lower right abutment of bridge, marked with black paint; elevation 31.46 feet above gage datum. Bench Mark No. 2 is the northeast corner of upstream end of pier; elevation 31.44 feet above gage datum. The gage is read by Joseph Gerken.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is face of right abutment, downstream side.

CHANNEL—The channel above and below the station is straight for 500 feet. Both banks are high and not subject to overflow. The bed is hard and firm.

REMARKS—The following data have been furnished by the U. S. Geological Survey:

DISCHARGE MEASUREMENTS OF TYGART RIVER, AT FETTERMAN, WEST VIRGINIA.

(Drainage area 1340 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
19	Oct. 30	Peterson & Walters,..	258	1640	1.17	5.20	1920	0.2 & 0.8 method.
20	Oct. 31	Peterson & Walters,..	258	1550	0.98	4.92	1530	0.2 & 0.8 method.

DISCHARGE TABLE FOR TYGART RIVER, AT FETTERMAN, W. VA., FROM JUNE 3, 1907 TO SEPT. 30, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft
2.00	4	.50	1040	7.00	5370	.50	10050	12.00	15060
.10	6	.60	1176	.10	5554	.60	10240	.10	15284
.20	9	.70	1324	.20	5738	.70	10430	.20	15508
.30	12	.80	1484	.30	5922	.80	10620	.30	15732
.40	16	.90	1650	.40	6107	.90	10810	.40	15956
.50	20	5.00	1820	.50	6292	10.00	11000	.50	16180
.60	25	.10	1990	.60	6477	.10	11190	.60	16404
.70	32	.20	2162	.70	6662	.20	11380	.70	16628
.80	40	.30	2334	.80	6848	.30	11570	.80	16852
.90	50	.40	2506	.90	7034	.40	11760	.90	17076
3.00	63	.50	2680	8.00	7220	.50	11950	13.00	17300
.10	80	.60	2854	.10	7406	.60	12140	14.00	19600
.20	103	.70	3030	.20	7592	.70	12330	15.00	21900
.30	134	.80	3206	.30	7780	.80	12520	16.00	24300
.40	172	.90	3382	.40	7968	.90	12710	17.00	26700
.50	218	6.00	3560	.50	8156	11.00	12900	18.00	29100
.60	268	.10	3738	.60	8344	.10	13116	19.00	31600
.70	323	.20	3916	.70	8532	.20	13332	20.00	34100
.80	384	.30	4096	.80	8720	.30	13548	21.00	36600
.90	451	.40	4276	.90	8910	.40	13764	22.00	39100
4.00	525	.50	4456	9.00	9100	.50	13980	23.00	41700
.10	607	.60	4638	.10	9290	.60	14196	24.00	44300
.20	699	.70	4820	.20	9480	.70	14412		
.30	802	.80	5002	.30	9670	.80	14628		
.40	916	.90	5186	.40	9860	.90	14844		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF TYGART RIVER, AT FETTERMAN, W. VA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.	
DAY.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.
1, ...	8.4	7780	5.4	2420	5.4	2420	6.0	3380	5.9	3210	8.8	8530	3.78	312	5.4	2330	3.68	253
2, ...	6.8	4820	5.3	2250	5.3	2250	5.4	2330	5.7	2850	8.2	7410	3.70	268	4.9	1480	3.60	213
3, ...	9.3	9480	5.6	2680	5.2	2080	5.05	1740	5.5	2510	7.5	6110	3.62	228	4.6	1040	3.58	204
4, ...	8.1	7220	8.2	7410	5.1	1900	4.9	1480	5.35	2250	6.1	3560	3.58	209	4.5	916	3.55	190
5, ...	6.8	4820	9.4	9670	5.05	1820	4.8	1320	5.0	1650	5.2	1990	3.52	181	4.2	607	3.52	177
6, ...	7.4	5920	7.1	5370	4.95	1650	4.65	1110	4.8	1320	4.9	1480	4.3	699	3.92	391	3.45	149
7, ...	12.9	16900	6.2	3740	4.8	1400	4.6	1040	4.6	1040	4.75	1250	4.2	607	3.72	274	3.40	131
8, ...	14.3	20100	5.6	2680	4.65	1110	4.55	978	4.5	916	5.3	2160	4.15	566	3.68	253	3.35	115
9, ...	14.1	19600	5.3	2250	4.6	1040	4.4	802	4.4	802	5.3	2160	4.1	525	3.62	223	3.30	101
10, ...	9.4	9670	5.1	1900	4.5	916	4.3	699	4.3	699	5.0	1650	5.05	1740	3.48	161	3.52	177
11, ...	8.4	7780	5.5	2590	4.9	1480	4.3	699	4.2	607	4.7	1180	10.0	10800	3.52	177	3.68	273
12.	11.6	14000	9.7	10200	6.4	4100	4.4	802	4.1	525	4.5	916	6.8	4820	3.78	306	3.60	213
13, ...	11.0	12700	8.0	7030	7.1	5370	4.7	1180	4.05	495	4.2	607	5.7	2850	7.4	5920	3.55	190
14, ...	8.0	7030	6.8	4820	7.2	5550	5.5	2510	4.0	458	4.1	525	6.6	4460	8.3	7590	3.50	168
15, ...	6.8	4820	6.7	4640	8.8	8530	5.9	3210	4.1	525	3.88	372	7.5	6110	6.8	4820	3.50	164
16, ...	6.0	3380	5.5	2590	8.3	7590	7.8	6660	4.6	1040	3.80	323	7.0	5190	5.05	1740	3.40	128
17, ...	6.3	3920	5.2	2080	6.5	4280	7.0	5190	5.6	2680	3.80	323	8.8	8530	4.7	1180	3.32	103
18, ...	7.7	6480	4.95	1650	5.6	2680	6.5	4280	7.0	5190	3.75	296	7.8	6660	4.5	916	3.55	186
19, ...	6.8	4820	4.8	1400	5.3	2160	6.2	3740	6.3	3920	3.75	296	6.0	3380	4.65	1110	3.90	372
20, ...	6.2	3740	4.5	978	5.2	1990	6.1	3560	5.45	2420	3.72	279	5.6	2680	4.9	1480	3.82	323
21, ...	6.3	3920	4.4	859	5.1	1820	6.0	3380	5.05	1740	3.68	258	5.4	2330	4.5	916	4.45	859
22, ...	6.6	4160	4.7	1250	4.9	1480	5.7	2850	5.5	2510	3.64	238	4.8	1320	4.2	607	5.6	2680
23, ...	6.5	4280	4.7	1250	4.7	1180	5.2	1990	10.6	12000	3.6	218	4.55	978	5.2	1990	5.8	3030
24, ...	7.1	5370	4.7	1250	4.6	1040	4.85	1400	14.3	20100	3.6	218	4.3	699	5.9	3210	5.3	2160
25, ...	8.4	7780	4.65	1180	4.5	916	4.7	1180	9.8	10400	4.2	607	4.5	916	5.5	2510	4.5	916
26, ...	8.0	7680	4.75	1320	5.5	2510	4.55	978	7.5	6110	4.4	802	5.6	2680	5.2	1990	4.1	510
27, ...	6.8	4820	5.4	2420	11.2	13200	4.6	1040	10.2	11200	4.2	607	5.2	1990	4.5	916	4.0	438
28, ...	6.4	4100	5.45	2510	12.8	16600	6.1	3560	15.2	22100	4.05	488	4.8	1320	4.15	566	3.95	404
29, ...	6.0	3380	......	......	8.6	8160	6.7	4640	12.6	16200	3.88	372	4.7	1180	3.98	431	3.8	312
30, ...	5.7	2850	......	......	7.0	5190	6.4	4100	9.8	10400	3.82	335	4.55	978	3.90	378	3.72	268
31, ...	5.5	2590	......	......	6.2	3740	......	......	10.1	11000	....	....	4.4	802	3.82	329	....	....

Note.—The "shifting channel" method was used in computing the flow, and the above discharge is provisional and subject to revision.

ESTIMATED MONTHLY DISCHARGE OF TYGART RIVER, AT FETTERMAN, W. VA.

(Drainage area 1340 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	20100	2590	7280	5.43	6.26
February,	10200	859	3230	2.41	2.51
March,	16600	916	3750	2.80	3.23
April,	6660	699	2390	1.78	1.99
May,	22100	458	5120	3.82	4.40
June,	8530	218	1520	1.13	1.26
July,	10800	181	2450	1.83	2.11
August,	7590	161	1510	1.13	1.30
September,	3030	101	513	.383	.43

Note.—The above discharge is provisional and subject to revision.

CHEAT RIVER.

DESCRIPTION OF BASIN.

The Cheat river, or its uppermost branch, the Shavers Fork, rises in the northern part of Pocahontas county, W. Va., and flows in a general northwesterly direction to its mouth in the Monongahela river, at Point Marion, Fayette county, Pa., about 90 miles below Pittsburgh, Pa., a distance of approximately 157 miles, 4 miles of which is in Pennsylvania. It drains an area of approximately 1,427 square miles, of which 98 lie in Pennsylvania. The source is in the point of coalescence of Back, Allegheny Mountain and Cheat Mountain, at elevation of approximately 4,500 feet, from which it falls to elevation 780 feet at its mouth, the total fall being 3,720 feet, or at the rate of 23.6 feet per mile. The river proper, which is formed by the junction of Shavers Fork and Dry Fork, at Parsons, W. Va., is at elevation 1,625 feet, and has a slope of approximately 11 feet per mile to its mouth, a distance of about 78 miles. The drainage basin of Shavers Fork is very long and narrow, while that of Dry Fork is notably fan-shaped. The headwaters of this river lie in a rough, mountainous region, many of the valleys being in deep gorges, with swiftly flowing mountain streams. The Cheat river, from the source of Shavers Fork for half its length, lies in a narrow steep-sided and uncultivated gorge, with the mountain slopes heavily timbered. Above Parsons, W. Virginia, for a distance of a few miles, the valley opens out with the stream flowing through low bottom land or flood plains. Below this point for a distance of 9 miles it passes through a steep-sided, broad valley, with cultivated and unusually level bottoms, the course of the stream being very tortuous. From this point to Mont Chateau, W. Va., there are numerous small patches of cultivated bottom land, while below this point the river then enters Pennsylvania through another gorge, which extends to its mouth.

Owing to the fact that the basin of this stream is long and narrow, being 100 miles in length by about 14 miles in width, together with other topographical features, conducive to the same result, the Cheat river has a rapidly fluctuating discharge, rising quickly in great floods, and reducing rapidly thereafter.

Approximately three-fourths of the entire drainage area is reported to be forest covered and coal is mined over a large portion of this watershed. There are very few towns of importance in this drainage basin, the largest being Rowlesburg and Parsons, W. Va., and Point Marion, Pa., which latter community uses this stream as a source of domestic water supply.

The mean annual precipitation over this watershed is from approximately 40 to 45 inches.

The discharge has been measured since July, 1899, at Ice's Ferry, near Morgantown, W. Va.

OHIO BASIN—STATION NO. 20.

CHEAT RIVER NEAR MORGANTOWN, W. VA.

DESCRIPTION OF STATION.

LOCATION—On highway bridge at Uneva, W. Va., 10 miles above the mouth of the river.

RECORDS AVAILABLE—Discharge complete from July 8 to December 30, 1899; July 1 to December 29, 1900; August 21, 1902 to December 31, 1905, and November 18, 1908 to September 30, 1913.

DRAINAGE AREA—1,380 square miles.

GAGE—A standard chain gage is attached to the bridge. The length of chain from the bottom of the weight to the marker is 40.79 feet. The elevation of zero is arbitrary. Bench Mark No. 1 is a mark on face of sandstone rock in edge of bank beside road, 20 feet downstream and 30 feet back from gage; elevation 21.13 feet above gage datum. The gage is read by C. F. Baker.

DISCHARGE MEASUREMENTS—Taken from the upstream side of the bridge, or by wading during low water.

CHANNEL AND WINTER FLOW—The channel is probably permanent. Ice forms sometimes to a thickness of several inches, and large ice jams may affect the relation of gage height to discharge during short periods in December, January and February.

REMARKS—The following data have been furnished by the U. S. Geological Survey:

DISCHARGE MEASUREMENTS OF CHEAT RIVER, NEAR MORGANTOWN, WEST VIRGINIA.

(Drainage area 1380 square miles.)

No.	Date.		Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
				Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913								
24	Jan.	8	Drake, ...	453	4690	6.22	9.55	29100	Surface msmt. computations revised since previous report.
25	Jan.	8	Drake, ...	453	4690	6.26	9.55	29200	Surface msmt. computations revised since previous report.
26	May	14	Drake, ...	366	2116	0.35	2.78	746	Surface measurement.
27	May	14	Drake, ...	366	2110	0.35	2.78	735	Surface msmt. computations not checked.
28	June	9	Drake, ...	381	2517	1.17	3.88	2960	Surface msmt. computations not checked.
29	June	9	Drake, ...	381	2520	1.14	3.88	2870	0.6 method.
30	Sept.	3	Drake, ...	149	251	1.31	2.20	329	Surface msmt. wading 1-3 mile above bridge.
31	Sept.	3	Drake, ...	149	251	1.31	2.20	329	Surface msmt. wading 1-3 mile above bridge.
32	Nov.	3	Peterson & Walters,	376	2320	0.54	3.22	1260	0.2 & 0.8 method.
33	Nov.	4	Peterson & Walters,	376	2280	0.50	3.14	1130	0.2 & 0.8 metbod.

DISCHARGE TABLE FOR CHEAT RIVER, NEAR MORGANTOWN, W. VA. FOR 1912 and 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.50	115	.40	1520	.30	8530	.20	18220	.10	27910
.60	140	.50	1730	.40	9040	.30	18730	.20	28420
.70	165	.60	1955	.50	9550	.40	19240	.30	28930
.80	190	.70	2200	.60	10060	.50	19750	.40	29440
.90	220	.80	2450	.70	10570	.60	20260	.50	29950
2.00	255	.90	2710	.80	11080	.70	20770	.60	30460
.10	290	4.00	3000	.90	11590	.80	21280	.70	30970
.20	330	.10	3300	6.00	12100	.90	21790	.80	31480
.30	375	.20	3620	.10	12610	8.00	22300	.90	31990
.40	425	.30	3960	.20	13120	.10	22810	10.00	32500
.50	480	.40	4320	.30	13630	.20	23320	11.00	37600
.60	545	.50	4700	.40	14140	.30	23830	12.00	42700
.70	625	.60	5110	.50	14650	.40	24340	13.00	47800
.80	710	.70	5550	.60	15160	.50	24850	14.00	52900
.90	805	.80	6020	.70	15670	.60	25360	15.00	58000
3.00	915	.90	6500	.80	16180	.70	25870		
.10	1045	5.00	7000	.90	16690	.80	26380		
.20	1185	.10	7510	7.00	17200	.90	26890		
.30	1340	.20	8020	.10	17710	9.00	27400		

Note.—This table bas been revised above gage height 4.2′ and is based on discharge measurements 22 to 25. This table applies to all years 1902-12 with proper change of gage heights 1902-09 by curve of relation as explained in 1910-11 Report of Water Supply Commission.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF CHEAT RIVER, NEAR MORGANTOWN, W. VA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.	
DAY.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.	G. H.	Dis.
1,	5.4	9040	4.1	3300	4.6	5110	4.25	3790	4.2	3620	5.9	11600	3.0	915	3.4	1520	2.3	375
2,	4.5	4700	4.2	3620	4.35	4140	3.95	2860	4.0	3000	5.0	7000	2.85	758	3.25	1260	2.2	330
3,	4.9	6500	4.0	3000	4.0	3000	3.95	2860	3.65	2080	4.4	4320	2.8	710	3.0	915	2.2	330
4,	5.6	10100	4.9	6500	3.75	2320	3.8	2450	3.5	1730	3.95	2860	2.7	625	2.85	758	2.2	330
5,	5.0	7000	4.8	6020	3.75	2320	3.6	1960	3.35	1430	3.75	2320	2.7	625	2.8	710	2.1	290
6,	4.8	6020	4.3	3960	3.65	2080	3.6	1960	3.3	1340	3.55	1840	3.1	1040	2.6	515	2.1	290
7,	8.7	25900	3.9	2710	3.4	1520	3.4	1520	3.2	1180	3.45	1620	3.45	1620	2.5	480	2.05	272
8,	9.4	29400	3.85	2580	3.15	1120	3.4	1520	3.05	980	3.6	1960	3.15	1120	2.45	452	2.05	272
9,	8.0	22300	3.7	2200	3.4	1520	3.3	1340	3.05	980	3.9	2710	2.9	805	2.4	425	2.15	310
10,	......	a15200	3.6	1960	3.65	2080	......	a1160	3.0	915	3.55	1840	4.3	3960	2.4	425	2.55	512
11,	5.2	8020	3.45	1620	4.35	4140	3.05	980	......	a812	3.35	1430	5.7	10600	2.4	425	2.5	480
12,	7.8	21300	5.5	9550	5.3	8530	3.45	1620	2.8	710	3.15	1120	4.25	3790	2.5	480	2.35	400
13,	6.9	16700	4.6	5110	4.8	6020	3.5	1730	2.8	710	3.05	980	3.8	2450	2.9	805	2.25	352
14,	5.4	9040	4.0	3000	4.9	6500	4.9	6500	2.8	710	3.0	915	4.7	5550	5.4	9040	2.15	310
15,	4.7	5550	3.95	2860	6.0	12100	4.6	5110	3.2	1180	2.9	805	5.8	11100	3.9	2710	2.15	310
16,	4.45	4510	3.55	1840	5.6	10100	6.1	12600	3.7	2200	2.75	668	5.1	7510	3.4	1520	2.1	290
17,	4.8	6020	3.4	1520	4.7	5550	5.2	8020	3.7	2200	2.7	625	4.8	6020	3.05	980	2.0	255
18,	5.0	7000	3.3	1340	4.25	3790	4.5	4700	......	a3080	2.6	545	6.0	12100	2.9	805	2.1	290
19,	4.9	6500	3.25	1260	4.0	3000	4.15	3460	4.3	3960	2.55	512	4.8	6020	2.85	758	2.6	545
20,	4.6	5110	3.3	1340	3.85	2580	4.0	3000	3.85	2580	2.5	480	4.4	4320	2.75	668	2.95	860
21,	4.45	4510	3.65	2080	3.7	2200	3.9	2710	3.95	2860	2.8	710	3.8	2450	2.75	668	2.8	710
22,	4.5	4700	4.1	3300	3.6	1960	3.7	2200	4.5	4700	2.6	515	3.5	1730	2.6	545	4.8	6020
23,	4.4	4320	4.3	3960	3.5	1730	3.6	1960	6.6	15200	2.6	545	3.25	1260	2.55	512	3.85	2580
24,	5.1	7510	4.15	3460	3.4	1520	3.45	1620	8.2	23300	3.3	1340	3.1	1040	2.65	585	3.3	1340
25,	5.5	9550	3.85	2580	3.3	1340	3.35	1430	......	a15400	3.75	2320	3.2	1180	3.15	1120	3.05	980
26,	5.1	7510	3.45	1620	4.3	3960	3.25	1260	5.1	7510	4.0	3000	3.6	1960	2.85	758	2.85	758
27,	4.6	5110	3.5	1730	7.5	19800	......	a2790	6.9	16700	3.45	1620	3.25	1260	2.7	625	2.7	625
28,	4.3	3960	4.3	3960	7.6	20300	4.4	4320	8.6	25400	3.85	2580	3.0	915	2.55	512	2.55	512
29,	4.05	3150	......	......	5.7	10600	4.3	3960	6.6	15200	3.4	1520	3.05	980	2.5	480	2.5	480
30,	3.85	2580	......	......	5.0	7000	4.35	4140	5.5	9550	3.25	1260	3.05	980	2.4	425	2.45	452
31,	3.85	2580	......	......	4.5	4700	......	......	8.1	22800	....	....	3.0	915	2.3	375	....	....

a=daily discharge interpolated.

ESTIMATED MONTHLY DISCHARGE OF CHEAT RIVER, NEAR MORGANTOWN, W. VA.

(Drainage area 1380 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	29400	2580	9080	6.58	7.59
February,	9550	1260	3140	2.28	2.37
March,	20300	1120	5250	3.80	4.38
April,	12600	980	3180	2.30	2.57
May,	25400	710	6260	4.54	5.23
June,	11600	480	2050	1.49	1.66
July,	12100	625	3110	2.25	2.59
August,	9040	375	1040	.754	.87
September,	6020	255	729	.528	.59

DUNKARD CREEK.

DESCRIPTION OF BASIN.

Dunkard creek, a tributary of the Monongahela river in Monongahela county, West Virginia, and Greene county, Pennsylvania, drains an area of approximately 235 square miles, of which 125 square miles lie in Pennsylvania. Rising in two forks, Pennsylvania and West Virginia Forks, the former heading in the south central part of Greene county, and the latter in the western part of Monongahela county, W. Virginia, which join on the Pennsylvania-West Virginia line, the stream follows a general easterly direction through a rolling, well settled, farming country, practically deforested, with many turns, crossing and recrossing the state line to its mouth, three miles below Point Marion, Pennsylvania. The distance from the forks to the mouth is about 36 miles.

The West Virginia Fork rises at an elevation of about 1,300 feet, and the Pennsylvania Fork at an elevation of about 1,400 feet. The junction lies at an elevation of 975 feet, and the mouth at an elevation of 800 feet. The forks have an approximate slope of 30 feet per mile, whereas the fall from the junction to the mouth is at the rate of 5 feet per mile. The principal tributaries are Pennsylvania and West Virginia forks. There are only a few small villages and one borough in this basin, none of which use the water of this stream for domestic supply. This creek in the fall of 1908 was absolutely dry at a point a short distance above its mouth.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured since October 14th, 1909, at "Bobtown," about two miles above the mouth.

OHIO BASIN—STATION NO. 21.

DUNKARD CREEK AT "BOBTOWN," PA.

DESCRIPTION OF STATION.

LOCATION—On single span, covered wooden bridge, at "Bobtown," Greene county, about two miles above the mouth.

RECORDS AVAILABLE—Discharge measurements and gage heights from October 14, 1909, to December 31, 1913.

DRAINAGE AREA—230 square miles.

GAGE—A 12 foot staff gage is bolted to the downstream wing of the left abutment. The elevation of zero is arbitrary. Bench Mark No. 1 is shelf on top of second course from bottom, third stone in from face; elevation 2.64 feet above gage datum. The gage is read twice daily by Mrs. Enlow Stoneking.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge during floods, and by wading during low stages. The initial point for sounding is top edge of bridge seat, left abutment.

CHANNEL—The channel is straight above and below the station. Both banks are high and not subject to overflow. The bed is composed of solid rock. There is a deep, quiet pool under the bridge, with very sluggish flow at low stages.

DISCHARGE MEASUREMENTS OF DUNKARD CREEK, AT "BOBTOWN," GREENE COUNTY, PA.

(Drainage area 230 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
4	Aug. 14	Boehringer, ...	34	21	0.25	0.93	5.3	Wading msmt. ½ mi. below bridge.

DAILY MEAN GAGE HEIGHTS OF DUNKARD CREEK, AT "BOBTOWN," GREENE COUNTY, PA.

1913.	JAN.	FEB.	MAR.	APR.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	2.70	2.52	2.90	2.19	2.05	2.78	1.20	1.25	0.62	0.70	1.30	1.46
2,	2.25	2.20	2.60	2.05	1.88	2.50	1.16	1.12	0.61	0.72	1.21	1.45
3,	3.40	2.19	2.24	1.98	1.78	2.20	1.05	1.05	0.60	0.80	1.18	1.48
4,	3.40	2.52	2.25	1.88	1.64	1.95	1.09	0.93	0.58	0.80	1.14	1.48
5,	2.72	2.40	2.23	1.80	1.60	1.78	1.02	0.92	0.56	0.80	1.11	1.47
6,	3.35	*2.34	2.29	1.72	1.54	1.68	1.00	0.92	0.55	0.79	1.10	1.48
7,	5.75	2.08	2.05	1.64	1.46	1.64	1.00	0.92	0.55	0.75	1.08	1.52
8,	a7.70	2.02	2.02	1.58	1.41	1.55	0.96	0.90	0.55	0.70	1.05	3.20
9,	4.42	1.95	2.20	1.56	1.40	1.54	1.02	0.88	0.54	0.72	1.20	2.59
10,	3.00	1.90	2.20	1.50	1.36	1.48	1.66	0.85	0.54	0.77	1.48	2.30
11,	3.00	1.82	2.55	1.58	1.32	1.39	1.72	0.85	0.54	0.78	1.98	2.12
12,	7.20	3.05	2.75	2.08	1.24	1.32	1.39	0.91	0.53	0.80	2.18	1.95
13,	3.88	2.41	2.48	2.06	1.24	1.25	1.28	0.95	0.53	0.79	3.75	1.88
14,	3.02	2.22	2.80	2.22	1.20	1.24	2.12	0.93	0.52	0.77	5.70	1.82
15,	2.60	2.10	2.92	2.11	1.32	1.19	3.10	0.90	0.52	0.77	4.25	1.72
16,	2.45	2.05	2.60	2.06	1.38	1.14	2.24	0.88	0.52	0.76	6.35	1.66
17,	2.85	1.98	2.32	1.92	1.69	1.10	5.20	0.86	0.52	0.75	4.08	1.62
18,	3.80	1.86	2.08	1.81	1.50	1.09	3.75	0.80	0.54	0.75	3.50	1.59
19,	3.54	1.88	1.98	1.71	1.42	1.04	2.65	0.78	0.56	0.78	2.60	1.56
20,	2.92	1.95	1.90	1.64	1.34	1.00	2.18	0.75	0.58	0.90	2.30	1.53
21,	3.20	2.15	1.82	1.59	1.42	1.05	1.82	0.75	0.68	0.95	2.15	1.50
22,	3.28	2.50	1.80	1.52	2.52	1.09	1.09	0.75	0.73	0.96	2.05	1.52
23,	3.12	2.82	1.68	1.46	4.60	1.11	1.62	0.74	0.75	1.00	1.85	1.90
24,	4.40	2.40	1.66	1.40	4.20	1.14	1.50	0.74	0.74	1.05	1.70	3.70
25,	3.34	2.12	1.65	1.38	2.92	1.15	1.38	0.72	0.75	1.65	1.60	3.35
26,	2.80	2.00	3.82	1.36	2.28	1.46	1.32	0.72	0.73	3.19	1.58	5.50
27,	2.52	2.14	b7.10	1.62	3.62	1.48	1.31	0.69	0.70	2.06	1.56	3.50
28,	2.42	2.85	4.85	2.07	5.20	1.42	1.26	0.66	0.70	1.78	1.52	2.70
29,	2.30	....	2.95	2.28	3.55	1.32	1.22	0.64	0.70	1.58	1.51	2.45
30,	2.30	....	2.56	2.38	2.98	1.23	1.20	0.62	0.70	1.48	1.50	2.28
31,	2.42	....	2.37	....	3.52	....	1.35	0.64	....	1.37	....	2.14

Note.—*Stream frozen Feb. 6-11 incl. a=Max. 8.30′ at 4 P. M. b=Max. 7.70′ at noon.

YOUGHIOGHENY RIVER.

DESCRIPTION OF BASIN.

The Youghiogheny river, the largest tributary of the Monongahela river, drains an area of approximately 1,800 square miles in Maryland, West Virginia and Pennsylvania, of which about 1,265 square miles lie in Pennsylvania. Rising near the Maryland-West Virginia boundary line, in Preston county, West Virginia, to the north of the headwaters of the Potomac river, and upon the western side of Great Savage Mountain, its course is almost due north, roughly paralleling the Monongahela river, between Negro Mountain, on the east, and Briary Mountain, on the west, it crosses the state line near Watsondale, at the junction of Fayette and Somerset counties.

On the upper reaches of this river the grade is steep, but the valley is open and rolling. It soon becomes more mountainous, however, and the stream flows between high, steep hills, ending abruptly at the water's edge, the channel being strewn with numerous boulders and large stones. The river continues northward in this manner, gradually losing its swiftness, but still retaining the hilly nature, to Somerfield, Pa., two miles above the state line, where the slope of the stream is more uniform and continues as such to its junction with the Casselman river. From Confluence, where it is joined by its largest tributary, Casselman river, to its mouth the river follows a general northwesterly direction, the valley being narrow and steep, and to Bidewell the stream flows at a fairly uniform grade, gradually developing into rapids with the valley assuming a more gorge-like form. Just above Ohiopyle the stream becomes very rapid, assuming its greatest fall as it makes a long loop around the mountain. Between Connellsville and West Newton the stream cuts through a succession of ridges, alternating with rolling country on either side, and from this point to its mouth the valley is wide and rolling.

The total length of this river is about 125 miles, of which approximately 83 miles lie in Pennsylvania. The elevation of the source is approximately 3,000 feet, and at the point where the Youghiogheny enters Pennsylvania the elevation is 1,400 feet, giving a slope of about 38 feet per mile in this distance. From the state line to Connellsville the fall is at the rate of approximately 17 feet per mile, and from Connellsville to the mouth, 43 miles, the rate is 3.5 feet per mile. Between Ohiopyle and Connellsville, a distance of 17.5 miles, the rate of fall is 19 feet per mile, reaching at Ohiopyle Falls a rate of over 50 feet per mile.

The principal tributaries of the Youghiogheny river in Pennsylvania are Big Sewickley creek, Indian creek and the Casselman river. There are many tributaries in Maryland and West Virginia, the principal being Bear creek, Deep creek, Little Youghiogheny and Rhine creeks.

The headwaters of this stream and the basin of it as far down as Connellsville is sparsely inhabited, well covered with second growth timber, with some farming and coal mining carried on. From Connellsville to the mouth the watershed is densely inhabited, especially in the valleys, which are industrially very active, the surrounding hills being practically deforested, while considerable farming is carried on. The region is the center of the vast bituminous coal producing and coke making belt and the streams are laden with mine water and sulphur. Four large boroughs and many large villages lie in this area, some of the communities obtaining a domestic water supply from the stream.

Navigation on the Youghiogheny river was at one time improved by the construction of dams and locks from McKeesport, at its mouth, to West Newton, 19 miles above. Since 1868, however, this navigation has been abandoned, and all dams and locks removed from the river.

The mean annual precipitation over the lower portion of this watershed is from 35 to 40 inches, the central portion from 45 to 50 inches, while the upper portion is subject to a rainfall of from 40 to 45 inches.

The discharge has been measured at Friendsville, Md., Confluence, Pa., and at Connellsville, Pa., since August 17, 1898, September 15, 1904, and July 22, 1908, respectively, the former, however, being discontinued on December 31, 1904.

OHIO BASIN—STATION NO. 22.

YOUGHIOGHENY RIVER AT CONFLUENCE, PA.

DESCRIPTION OF STATION.

LOCATION—On the highway bridge about one-half mile from the B. & O. Railroad Station, at Confluence, Somerset Co.

RECORDS AVAILABLE—Discharge complete from Sept. 15, 1904, to December 31, 1913.

DRAINAGE AREA—435 square miles.

GAGE—A standard chain gage is fastened to the downstream handrail of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 23.22 feet. Bench Mark No. 1 is a cross on head of rivet in bedplate at right abutment on downstream side; elevation 20.53 feet above gage datum. Bench Mark No. 2 is a cross on lower chord of bridge under the gage box; elevation 20.28 feet above gage datum. The gage is read once daily by Lloyd L. Mountain.

DISCHARGE MEASUREMENTS—Taken from the upstream side of the bridge. The initial point for soundings is center of bridge pin over right abutment on upstream side of bridge.

CHANNEL—The channel above and below the station is straight for 200 feet and 500 feet respectively. The right bank is high and not subject to overflow. The left bank is low, clean, and overflows during high water. The bed is rocky, and there are two channels at all stages.

REMARKS—There is a small cobblestone dam 4 to 6 inches high under the bridge.

DISCHARGE MEASUREMENTS OF YOUGHIOGHENY RIVER, AT CONFLUENCE, SOMERSET COUNTY, PA.

(Drainage area 435 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
22	1913 Aug. 12	Boehringer, ...	191	144	1.05	1.93	151	Wading msmt.

DISCHARGE TABLE FOR YOUGHIOGHENY RIVER, AT CONFLUENCE, SOMERSET COUNTY, FROM JAN. 1, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.10	10	.10	1950	.10	6090	.10	10290	.10	14490
.20	15	.20	2070	.20	6230	.20	10430	.20	14630
.30	25	.30	2190	.30	6370	.30	10570	.30	14770
.40	40	.40	2310	.40	6510	.40	10710	.40	14910
.50	55	.50	2450	.50	6650	.50	10850	.50	15050
.60	75	.60	2590	.60	6790	.60	10990	.60	15190
.70	95	.70	2730	.70	6930	.70	11130	.70	15330
.80	120	.80	2870	.80	7070	.80	11270	.80	15470
.90	150	.90	3010	.90	7210	.90	11410	.90	15610
2.00	180	5.00	3150	8.00	7350	11.00	11550	14.00	15750
.10	220	.10	3290	.10	7490	.10	11690	.10	15890
.20	270	.20	3430	.20	7630	.20	11830	.20	16030
.30	320	.30	3570	.30	7770	.30	11970	.30	16170
.40	380	.40	3710	.40	7910	.40	12110	.40	16310
.50	450	.50	3850	.50	8050	.50	12250	.50	16450
.60	520	.60	3990	.60	8190	.60	12390	.60	16590
.70	590	.70	4130	.70	8330	.70	12530	.70	16730
.80	670	.80	4270	.80	8470	.80	12670	.80	16870
.90	750	.90	4410	.90	8610	.90	12810	.90	17010
3.00	840	6.00	4550	9.00	8750	12.00	12950	15.00	17150
.10	930	.10	4690	.10	8890	.10	13090	.10	17290
.20	1020	.20	4830	.20	9030	.20	13230	.20	17430
.30	1110	.30	4970	.30	9170	.30	13370	.30	17570
.40	1210	.40	5110	.40	9310	.40	13510	.40	17710
.50	1310	.50	5250	.50	9450	.50	13650	.50	17850
.60	1410	.60	5390	.60	9590	.60	13790	.60	17990
.70	1510	.70	5530	.70	9730	.70	13930	.70	18130
.80	1610	.80	5670	.80	9870	.80	14070	.80	18270
.90	1720	.90	5810	.90	10010	.90	14210	.90	18410
4.00	1830	7.00	5950	10.00	10150	13.00	14350		

Note.—Curve below 6.0 feet was changed on account of 2 measurements made in 1912-13; above 6.0 feet it is coincident with that formerly used.

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF YOUGHIOGHENY RIVER, AT CONFLUENCE, SOMERSET CO., PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	4.50	2450	3.30	1110	3.80	1610	3.66	1470	2.66	562	4.82	2900	2.52	464	2.02	188	1.45	48	2.00	180	2.99	831	2.53	471
2, ...	3.80	1610	3.10	930	3.40	1210	3.51	1320	2.61	527	4.42	2350	2.62	534	2.02	188	1.40	40	2.10	220	2.89	742	2.53	471
3, ...	5.90	1410	3.20	1020	3.30	1110	3.71	1520	2.56	492	3.92	1740	2.57	499	1.97	171	1.40	40	2.25	295	2.79	662	2.48	436
4, ...	4.80	2870	3.80	1610	3.20	1020	3.81	1620	2.51	457	3.52	1330	2.47	429	1.92	176	1.40	40	2.40	380	2.74	622	2.53	471
5, ...	4.50	2450	3.45	1260	3.10	930	3.51	1320	2.51	457	3.32	1130	2.42	394	1.82	126	1.35	32	2.35	350	2.64	548	2.43	401
6, ...	5.00	3150	3.20	1020	3.00	840	3.26	1070	2.51	457	3.17	993	2.37	362	1.82	126	1.35	32	2.30	320	2.59	513	2.43	401
7, ...	8.50	8050	3.00	840	2.90	750	3.11	939	2.51	457	3.07	903	2.32	332	1.82	126	1.35	32	2.30	320	2.59	513	3.48	1290
8, ...	11.70	12500	3.00	840	2.85	710	3.01	849	2.46	422	3.42	1230	2.27	305	1.77	112	1.40	40	2.25	295	2.54	478	4.18	2050
9, ...	7.70	6830	2.90	750	2.75	630	2.91	759	2.46	422	3.12	948	2.27	305	1.77	112	1.45	48	2.20	270	2.59	513	3.68	1490
10, ...	5.10	3290	2.90	750	3.00	840	2.71	598	2.41	387	2.92	768	2.22	280	1.72	100	1.40	40	2.20	270	2.79	662	3.53	1340
11, ...	5.70	4130	3.25	1060	4.05	1890	2.71	598	2.41	387	2.72	606	2.17	255	1.72	100	1.40	40	2.15	215	2.99	831	3.28	1090
12, ...	10.00	16200	3.80	1610	3.80	1610	3.01	849	2.41	387	2.57	499	2.17	255	1.92	156	1.45	48	2.10	220	5.09	3280	3.13	957
13, ...	6.85	5740	3.50	1310	3.65	1460	3.51	1320	2.51	457	2.47	429	2.27	305	2.52	464	1.40	40	2.05	200	8.24	7690	2.98	822
14, ...	5.20	3430	3.25	1060	4.50	2150	3.71	1520	2.91	759	2.37	362	2.72	606	2.36	356	1.40	40	2.00	180	7.09	6080	2.98	822
15, ...	4.40	2320	3.10	930	4.40	2320	4.46	2400	3.11	939	2.27	305	3.02	858	2.06	204	1.40	40	1.95	165	6.99	5940	2.93	777
16, ...	4.35	2260	3.00	810	3.90	1720	4.26	2140	3.41	1220	2.27	305	3.82	1630	2.01	181	1.35	32	1.90	150	10.24	10500	2.93	777
17, ...	4.40	2320	2.85	710	3.60	1410	3.86	1680	3.51	1320	2.22	280	2.82	686	1.96	168	1.35	32	1.85	135	8.09	7480	2.88	731
18, ...	4.50	2450	2.75	630	3.40	1210	3.56	1370	3.11	939	2.22	280	2.72	606	1.91	153	1.40	40	1.80	120	5.29	3560	2.98	822
19, ...	4.30	2190	2.65	555	3.25	1060	3.36	1170	3.01	819	2.32	312	2.62	531	1.91	153	1.60	75	2.00	180	4.79	2860	2.98	822
20, ...	3.90	1720	2.65	555	3.15	975	3.11	939	2.91	759	2.27	305	2.52	464	1.86	138	2.00	180	2.95	795	4.49	2440	2.88	734
21, ...	3.95	1780	2.90	750	3.05	885	2.96	804	3.31	1120	2.27	305	2.42	394	1.81	123	2.20	270	3.60	1410	4.19	2060	2.78	654
22, ...	3.70	1510	3.40	1210	3.00	840	2.91	759	4.01	1840	2.22	280	2.37	362	1.76	110	2.35	350	3.25	1060	3.84	1650	2.93	777
23, ...	3.60	1410	3.30	1110	3.00	840	2.81	678	7.06	6030	2.22	280	2.32	332	1.71	98	2.20	270	3.15	975	3.49	1300	2.98	822
24, ...	4.65	2660	3.20	1020	2.95	795	2.76	638	8.21	7640	2.22	280	2.27	305	1.66	87	2.00	180	3.30	1110	3.19	1010	3.48	1290
25, ...	4.70	2730	3.10	930	3.00	840	2.76	638	5.31	3580	2.22	280	2.52	464	1.61	77	1.90	150	4.40	2320	2.89	742	3.68	1490
26, ...	4.25	2120	3.00	840	4.70	2730	2.71	598	4.21	2080	2.17	255	2.42	391	1.76	67	1.80	120	6.50	5250	2.79	662	3.98	1810
27, ...	3.95	1780	3.00	840	6.75	5600	2.66	562	7.71	6940	2.82	686	2.32	332	1.51	57	1.65	85	4.80	2870	2.69	583	3.58	1390
28, ...	3.70	1510	4.75	2800	5.50	3850	2.61	527	6.41	5120	2.72	606	2.22	280	1.51	57	1.55	65	3.70	1510	2.64	548	3.33	1110
29, ...	3.50	1310	....	......	4.45	2380	2.61	527	5.61	4000	2.62	534	2.17	255	1.46	49	1.45	48	3.35	1160	2.59	513	3.23	1050
30, ...	3.30	1110	....	......	3.95	1780	2.71	598	5.01	3160	2.52	464	2.12	230	1.46	49	1.65	85	3.20	1020	2.59	513	3.18	1000
31, ...	3.50	1310	....	......	3.80	1610	....	......	5.21	3440	....	......	2.07	208	1.46	49	....	......	3.10	930	......	......	2.98	822

ESTIMATED MONTHLY DISCHARGE OF YOUGHIOGHENY RIVER, AT CONFLUENCE, SOMERSET COUNTY, PA.

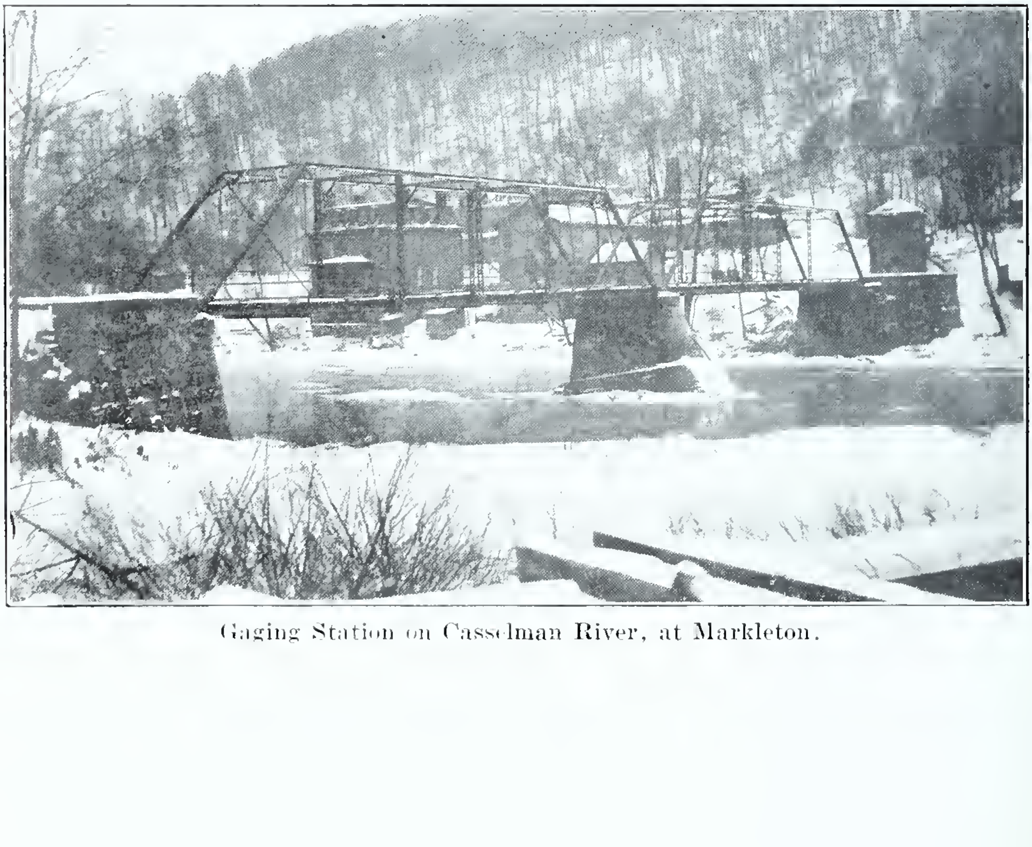
(Drainage area 435 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	12500	1110	3350	7.701	8.878
February,	1610	555	1030	2.368	2.466
March,	5600	630	1550	3.563	4.108
April,	2400	527	1060	2.437	2.719
May,	7640	387	1860	4.276	4.930
June,	2900	255	732	1.683	1.878
July,	1630	208	441	1.014	1.169
August,	464	49	139	0.320	0.369
September,	350	32	86	0.198	0.221
October,	5250	120	803	1.846	2.128
November,	10500	478	2210	5.080	5.668
December,	2050	401	949	2.182	2.515
The year,	12500	32	1180	2.722	37.049

CASSELMAN RIVER.

DESCRIPTION OF BASIN.

The Casselman river, the largest tributary of the Youghiogheny river, drains an area of approximately 578 square miles, of which 480 lie in Pennsylvania and 98 in Maryland. Rising in two branches, the North and the South, in Garrett county, Maryland, which join in the above county about four miles south of the Mason and Dixon line, the stream flows northeasterly into Pennsylvania at Meyersdale, Somerset county, where it turns northwesterly to Rockwood and thence southwesterly to the Youghiogheny river, at Confluence, Somerset county, Pa. The North and South Branches respectively, are 13 and 8 miles long, and the main river, from their junction to its mouth, is 23 miles in length. Its course through Maryland and the southern part of Somerset county, Pa., lies through a fertile, rolling valley, between Negro and Meadow mountains, whose average width is about six miles. From Meyersdale to its mouth, the course of the stream becomes more confined, and the valley is steep and grows deeper toward its mouth. This river has a rapid fall throughout practically its entire length. The principal tributary is Laurel Hill creek, which enters the river just above its confluence with the Youghiogheny river. The valleys are largely under cultivation, while the hillsides and mountain tops are covered with second growth timber.



Gaging Station on Casselman River, at Markleton.

There are numerous small boroughs and villages in this drainage basin. Bituminous coal is being extensively mined, and with farming, is the principal industry. The drainage basin has been virtually deforested, but is rapidly being covered with second growth. A few of the tributaries of the Casselman river are used as sources for domestic supply.

The mean annual precipitation over this watershed is between 40 and 45 inches.

The discharge has been measured from September 15th, 1904, to August 11, 1913 at Confluence, about one mile above the mouth. and since August 25, 1913, at Markleton, Somerset county.

OHIO BASIN—STATION NO. 23.

CASSELMAN RIVER AT MARKLETON, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, through-truss, highway bridge, at B. & O. Railroad Station, Markleton, Somerset county.

RECORDS AVAILABLE—Discharge measurements and gage heights from August 25, to December 31, 1913.

DRAINAGE AREA—365 square miles.

GAGE—A chain gage is fastened on the downstream handrail of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 23.66 feet. Bench Mark No. 1 is the outer downstream corner of right bridge seat; elevation 20.25 feet above gage datum. The gage is read twice daily by C. R. Sanders.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is the center of bridge pin, right abutment, downstream side.

CHANNEL—The channel is straight above and below the station for 1,200 feet and 1,500 feet respectively. Both banks are high and not subject to overflow. The bed is composed of gravel and boulders.

DISCHARGE MEASUREMENTS OF CASSELMAN RIVER, AT MARKLETON, SOMERSET COUNTY, PA.

(Drainage area 365 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
1	Aug. 13	Boehringer, ...	165	314	0.75	2.80	235	0.6 msmt.

DAILY MEAN GAGE HEIGHTS OF CASSELMAN RIVER, AT MARKLETON, SOMERSET COUNTY, PA.

1913.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G. H.	G. H.	G. H.	G. H.	G. H.
1,	....	1.90	2.10	3.90	3.10
2,	....	1.90	2.08	3.35	3.10
3,	....	1.90	2.02	3.00	3.10
4,	....	1.90	2.00	2.00	3.10
5,	....	1.90	2.00	2.00	3.10
6,	....	1.90	2.00	2.00	3.10
7,	....	1.90	2.00	2.00	3.10
8,	....	2.90	2.25	2.00	3.10
9,	....	2.00	2.50	2.95	3.10
10,	....	2.00	2.50	3.00	3.00
11,	....	1.90	2.50	3.01	3.05
12,	....	1.90	2.50	4.00	3.35
13,	....	1.90	2.50	4.90	3.35
14,	....	1.90	2.50	4.90	3.40
15,	....	1.91	2.50	4.90	3.30
16,	....	1.90	2.50	4.91	3.20
17,	....	1.90	2.50	4.00	3.15
18,	....	1.90	2.50	2.95	3.20
19,	....	1.90	2.50	2.90	3.10
20,	....	1.90	2.50	2.90	2.90
21,	....	1.90	2.52	2.90	3.15
22,	....	2.01	2.51	2.90	3.10
23,	....	2.00	2.75	2.50	3.15
24,	....	2.00	3.70	2.50	3.50
25,	2.06	2.00	5.25	2.49	3.45
26,	2.00	2.92	6.60	2.00	3.70
27,	2.00	2.90	6.40	2.00	3.40
28,	1.90	2.90	5.35	2.50	3.25
29,	1.95	2.45	4.75	3.00	3.40
30,	1.95	2.46	4.10	3.00	3.40
31,	2.00	....	4.00	....	3.25

OHIO BASIN—STATION NO. 24.

CASSELMAN RIVER AT CONFLUENCE, PA.

DESCRIPTION OF STATION.

LOCATION—On highway bridge about 500 yards from B. & O. Railroad Station, at Confluence, Somerset county.

RECORDS AVAILABLE—Discharge complete from September 15, 1904, to August 11, 1913.

DRAINAGE AREA—450 square miles.

GAGE—A standard chain gage was fastened to the upstream hand-rail. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker was 21.40 feet. Bench Mark No. 1 is a chisel draft marked with paint on the right abutment on the downstream side; elevation 17.88 feet above gage datum. Bench Mark No. 2 is a cross on top of lower chord of bridge near gage; elevation 18.61 feet above gage datum. The gage was read once daily by Lloyd L. Mountain.

DISCHARGE MEASUREMENTS—Taken from the upstream side of the bridge. The initial point for soundings is center of bridge pin, over right abutment on upstream side.

CHANNEL—The channel above and below the station is straight for 200 feet and 500 feet respectively. The right bank is high and not subject to overflow. The left bank is low and subject to overflow during extreme high stages. The bed is composed of boulders, with some vegetation. There are two channels at all stages, as well as a swift velocity under the bridge.

REMARKS—Station discontinued on August 11, 1913, and re-established at Markleton, Somerset county.

DISCHARGE TABLE FOR CASSELMAN RIVER, AT CONFLUENCE, SOMERSET COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.30	8	2.00	220	.70	780	.40	1495	.10	2300
.40	20	.10	280	.80	875	.50	1605	.20	2420
.50	37	.20	350	.90	970	.60	1720	.30	2540
.60	61	.30	430	3.00	1070	.70	1835	.40	2660
.70	93	.40	510	.10	1175	.80	1950	.50	2785
.80	130	.50	600	.20	1280	.90	2065	.60	2910
.90	170	.60	690	.30	1385	4.00	2180	.70	3035

BACKWATER DISCHARGE TABLE FOR CASSELMAN RIVER, AT CONFLUENCE, SOMERSET COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
4.00	2175	.90	4560	.80	8390	.70	12325	.60	16265
.10	2275	7.00	4680	.90	8525	.80	12465	.70	16400
.20	2370	.10	4800	10.00	8660	.90	12600	.80	16540
.30	2460	.20	4925	.10	8795	13.00	12735	.90	16675
.40	2550	.30	5050	.20	8930	.10	12870	16.00	16810
.50	2630	.40	5170	.30	9065	.20	13005	.10	16945
.60	2705	.50	5290	.40	9205	.30	13140	.20	17080
.70	2780	.60	5420	.50	9340	.40	13280	.30	17215
.80	2850	.70	5545	.60	9475	.50	13415	.40	17355
.90	2920	.80	5675	.70	9610	.60	13550	.50	17490
5.00	2990	.90	5810	.80	9745	.70	13685	.60	17625
.10	3060	8.00	5950	.90	9880	.80	13820	.70	17760
.20	3125	.10	6080	11.00	16020	.90	13955	.80	17895
.30	3190	.20	6220	.10	10155	14.00	14095	.90	18030
.40	3255	.30	6355	.20	10290	.10	14230	17.00	18170
.50	3320	.40	6490	.30	10425	.20	14365	.10	18305
.60	3375	.50	6625	.40	10560	.30	14500	.20	18440
.70	3430	.60	6760	.50	10695	.40	14635	.30	18575
.80	3500	.70	6895	.60	10835	.50	14770	.40	18710
.90	3570	.80	7030	.70	10970	.60	14910	.50	18845
6.00	3640	.90	7165	.80	11105	.70	15045	.60	18985
.10	3710	9.00	7300	.90	11240	.80	15180	.70	19120
.20	3780	.10	7435	12.00	11375	.90	15315	.80	19255
.30	3875	.20	7575	.10	11510	15.00	15450	.90	19490
.40	3970	.30	7710	.20	11650	.10	15585	18.00	19525
.50	4080	.40	7845	.30	11785	.20	15725	.10	19660
.60	4200	.50	7980	.40	11920	.30	15860		
.70	4320	.60	8115	.50	12055	.40	15995		
.80	4440	.70	8250	.60	12190	.50	16130		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF CASSELMAN RIVER, AT CONFLUENCE, SOMERSET COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.63	1750	2.77	846	3.46	1560	3.20	1280	2.49	591	3.63	1750	2.27	406	1.81	134
2,	3.08	1150	2.57	663	3.06	1130	3.05	1120	2.49	591	3.33	1420	2.17	329	1.76	115
3,	5.28	3180	2.72	799	2.86	932	4.05	2240	2.34	462	3.13	1210	2.07	262	1.66	80
4,	4.08	2280	2.77	846	2.76	837	3.75	1890	2.29	422	2.93	1000	1.97	205	1.61	64
5,	3.78	1930	2.57	663	2.81	884	3.45	1550	2.24	382	2.78	856	1.87	158	1.61	64
6,	4.18	2400	2.37	486	2.71	790	3.20	1280	2.24	382	2.68	762	1.77	119	1.61	64
7,	7.73	5580	2.22	366	2.61	699	2.95	1020	2.24	382	2.63	717	1.72	100	1.56	51
8,	11.68	10900	2.22	366	2.51	609	2.90	970	2.24	382	2.83	904	1.72	100	1.56	51
9,	6.88	4540	2.17	329	2.46	564	2.85	922	2.19	343	2.73	808	1.72	100	1.56	51
10,	4.53	2650	2.12	294	2.81	884	2.75	828	2.19	343	2.63	717	1.72	100	1.71	97
11,	5.28	3180	2.67	753	3.81	1960	2.80	875	2.14	308	2.53	627	1.62	67	*1.91	175
12,	9.48	7950	2.77	846	3.61	1730	3.00	1070	2.14	308	2.43	537	1.72	100	......	......
13,	5.83	3520	2.57	663	3.46	1560	3.45	1550	2.19	343	2.33	454	2.02	232	......	......
14,	4.38	2640	2.57	663	4.06	2250	3.70	1810	2.34	462	2.28	414	2.52	618	......	......
15,	3.68	1810	2.52	618	3.76	1900	4.40	2600	2.44	546	2.23	374	2.52	618	......	......
16,	3.68	1810	2.47	573	3.46	1560	4.15	2360	2.64	726	2.23	374	2.42	528	......	......
17,	3.98	2160	2.47	573	3.16	1240	3.65	1780	2.94	1010	2.18	336	2.22	366	......	......
18,	4.08	2280	2.42	528	2.96	1030	3.45	1550	2.64	726	2.18	336	2.17	329	......	......
19,	3.83	1980	2.37	486	2.96	1030	3.20	1280	2.54	636	2.33	454	2.17	329	......	......
20,	3.48	1580	2.37	486	2.96	1030	2.95	1020	2.49	591	2.28	414	2.12	294	......	......
21,	3.53	1640	2.47	573	2.86	932	2.80	875	2.84	913	2.23	374	2.12	294	......	......
22,	3.23	1310	2.97	1040	2.86	932	2.75	828	4.14	2350	2.18	336	2.07	262	......	......
23,	3.23	1310	2.82	894	2.81	884	2.70	780	6.04	3670	2.18	336	2.07	262	......	......
24,	4.23	2160	2.67	753	2.81	884	2.65	735	6.84	4490	2.18	336	2.02	232	......	......
25,	3.83	1980	2.57	663	2.76	837	2.60	690	4.44	2710	2.18	336	2.17	329	......	......
26,	3.48	1580	2.47	573	3.81	1960	2.60	690	3.94	2110	2.13	301	2.12	294	......	......
27,	3.28	1360	2.57	663	6.66	4270	2.55	645	7.44	5220	2.68	762	2.07	262	......	......
28,	3.08	1150	4.47	2750	4.81	2860	2.50	600	5.59	3370	2.58	672	2.02	232	......	......
29,	2.93	1000	......	......	3.86	2020	2.45	555	4.64	2960	2.48	582	1.97	205	......	......
30,	2.78	856	......	......	3.41	1510	2.55	645	3.84	2600	2.38	494	1.92	180	......	......
31,	2.98	1050	......	......	3.31	1400	....	......	4.01	2230	......	......	1.92	180	......	......

*Station discontinued at Confluence and re-established at Markleton on August 13.

ESTIMATED MONTHLY DISCHARGE OF CASSELMAN RIVER, AT CONFLUENCE, SOMERSET COUNTY, PA.

(Drainage area 450 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	10900	856	2610	5.800	6.687
February,	2750	294	706	1.569	1.634
March,	4270	564	1380	3.067	3.536
April,	2660	555	1200	2.667	2.976
May,	5220	308	1350	3.000	3.459
June,	1750	301	633	1.407	1.570
July,	618	67	261	.580	0.669

Station discontinued at Confluence and re-established August 13 at Markleton.

LAUREL HILL CREEK.

DESCRIPTION OF BASIN.

Laurel Hill creek, in Somerset and Fayette counties, the principal tributary of the Casselman river, drains an area of approximately 125 square miles. Rising in the southeastern corner of Jefferson township, Somerset county, this stream flows northward a short distance and then, describing a semi-circle, turns southward through a hilly farming country, almost deforested and underlain with bitumous coal, to its mouth at Confluence, a distance of about 30 miles. There are many tributaries to this stream, none of which, however, drain an area of more than seven or eight square miles, the watershed being an approximate parallellogram seven miles in width and about 17 miles in length. One borough and numerous farming villages are located on this basin. A few private water supplies are obtained from this watershed.

The mean annual precipitation over this watershed is from 40 to 45 inches.

The discharge has been measured from September 15th, 1904, to August 11, 1913, at Confluence, near its mouth, and since August 12, 1913, at Ursina, about 3 miles above the mouth.

Gaging Station on Laurel Hill Creek at Ursina.

OHIO BASIN—STATION NO. 25.

LAUREL HILL CREEK AT URSINA, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, through-truss, highway bridge, at Ursina, Somerset county, 2 miles above Confluence.

RECORDS AVAILABLE—Discharge measurements and gage heights from August 12, to December 31, 1913.

DRAINAGE AREA—122 square miles.

GAGE—A chain gage is fastened to the upstream handrail of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 17.11 feet. Bench Mark No. 1 is on top of the fourth stone from the upstream corner of the left abutment in the 9th course down from the top; elevation 5.475 feet above gage datum. The gage is read twice daily by A. J. Case.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge, and by wading. The initial point for soundings is the face of the right abutment.

CHANNEL—The channel above and below the station is straight for 1,500 feet and 1,000 feet respectively. The right and left banks are high and not subject to overflow. The bed is composed of gravel and stones.

DISCHARGE MEASUREMENTS OF LAUREL HILL CREEK, AT URSINA, SOMERSET COUNTY, PA.

(Drainage area 122 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913.							
1	Aug. 12	Boehringer, ...	139	115	0.70	2.04	81	Surf. msmt.

DAILY MEAN GAGE HEIGHTS OF LAUREL HILL CREEK, AT URSINA, SOMERSET COUNTY, PA.

1913.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G H	G H	G H	G H	G H
1,	....	1.60	1.70	2.40	2.30
2,	....	1.58	1.75	2.30	2.30
3,	....	1.50	2.25	2.25	2.30
4,	....	1.51	2.15	2.30	2.25
5,	....	1.50	1.90	2.20	2.25
6,	....	1.50	1.85	2.20	2.25
7,	....	1.51	1.80	2.12	2.95
8,	....	1.65	1.75	2.15	3.25
9,	....	1.70	1.72	2.50	2.92
10,	....	1.68	1.70	2.70	2.70
11,	....	1.60	1.75	2.60	2.60
12,	....	1.60	1.78	2.60	2.50
13,	....	1.60	1.78	3.10	2.45
14,	....	1.60	1.75	5.20	2.40
15,	1.72	1.58	1.72	4.25	2.38
16,	1.70	1.51	1.70	4.65	2.32
17,	1.70	1.56	1.62	4.12	2.30
18,	1.68	1.72	1.75	3.35	2.30
19,	1.65	1.90	1.80	3.02	2.25
20,	1.62	1.80	2.70	2.75	2.25
21,	1.60	2.02	2.55	2.60	2.20
22,	1.60	2.05	2.25	2.50	2.30
23,	1.68	1.88	2.15	2.50	2.40
24,	1.80	1.72	2.30	2.35	2.70
25,	1.68	1.70	2.90	2.30	2.65
26,	1.60	1.68	4.15	2.30	2.95
27,	1.60	1.65	3.25	2.30	2.65
28,	1.60	1.68	2.82	2.28	2.50
29,	1.60	1.65	2.55	2.35	2.50
30,	1.60	1.60	2.55	2.32	2.40
31,	1.60	....	2.52	....	2.35

OHIO BASIN—STATION NO. 26.

LAUREL HILL CREEK AT CONFLUENCE, PA.

DESCRIPTION OF STATION.

LOCATION—On highway bridge, near tannery, about one-fourth mile from B. & O. Station, at Confluence, Somerset Co.

RECORDS AVAILABLE—Discharge complete from September 15, 1904 to August 11, 1913.

DRAINAGE AREA—126 square miles.

GAGE—A standard chain gage was fastened to the downstream handrail. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker was 17.48 feet. Bench Mark No. 1 is a cross on top of bolt in bedplate of bridge at right abutment, elevation 14.16 feet above gage datum. Bench Mark No. 2 is a cross on lower chord of bridge under gage box; elevation 14.74 feet above gage datum. The gage was read once daily by Lloyd L. Mountain.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. The initial point for soundings is center of bridge pin over left abutment on left side of bridge.

CHANNEL—The channel above and below the station is straight for 25 feet and 300 feet respectively. The right bank is low, clean, and subject to overflow during high water. The left bank is high and not subject to overflow. The bed is composed of rough cobblestones, and the current is swift.

REMARKS—This station was of value chiefly for low water measurements, as the discharge values for high gage readings are liable to be considerably in error owing to frequent backwater from the Youghiogheny and Casselman rivers. Station discontinued on August 11, 1913, and re-established at Ursina on August 12, 1913.

DISCHARGE TABLE FOR LAUREL HILL CREEK, AT CONFLUENCE, SOMERSET COUNTY, FROM SEPT. 16, 1904 TO AUG. 11, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.40	1	.10	95	.80	425	.50	835	.20	1165
.50	4	.20	130	.90	495	.60	885	.30	1210
.60	8	.30	170	3.00	560	.70	935	.40	1255
.70	16	.40	210	.10	625	.80	985	.50	1295
.80	26	.50	260	.20	680	.90	1030	.60	1335
.90	41	.60	310	.30	735	4.00	1075	.70	1375
2.00	62	.70	365	.40	785	.10	1120		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF LAUREL HILL CREEK, AT CONFLUENCE, SOMERSET COUNTY, PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1,	3.21	686	2.61	316	3.22	691	2.93	514	2.28	162	2.99	554	2.00	62	1.66	13
2,	2.81	432	2.51	265	3.02	573	2.88	481	2.23	142	2.74	389	1.90	41	1.61	9
3,	4.01	1080	2.66	343	2.97	540	3.68	925	2.23	142	2.64	332	1.85	34	1.61	9
4,	3.66	915	2.61	316	2.92	508	3.23	696	2.18	123	2.49	255	1.80	26	1.56	6
5,	3.46	815	2.51	265	2.82	439	2.93	514	2.18	123	2.49	255	1.75	21	1.56	6
6,	3.76	965	2.36	194	2.72	377	2.73	383	2.18	123	2.64	332	1.70	16	1.56	6
7,	6.11	......	2.26	154	2.62	321	2.58	300	2.18	123	2.74	389	1.65	12	1.56	6
8,	9.76	......	2.21	134	2.57	295	2.53	275	2.18	123	2.84	453	1.65	12	1.56	6
9,	5.01	......	2.21	134	2.52	270	2.48	250	2.18	123	2.64	332	1.65	12	1.56	6
10,	3.66	915	2.16	116	2.77	407	2.43	225	2.13	106	2.44	230	1.65	12	1.56	6
11,	4.01	1080	2.76	401	3.47	820	2.53	275	2.13	106	2.34	186	1.65	12	*1.66	13
12,	7.41	......	2.76	401	3.22	691	2.83	446	2.18	123	2.24	146	1.65	12	......	......
13,	4.46	1280	2.41	215	3.07	606	3.23	696	2.23	142	2.09	92	1.65	12	......	......
14,	3.51	840	2.41	215	3.32	745	3.13	642	2.38	202	1.99	60	2.30	170	......	......
15,	3.11	630	2.41	215	3.02	573	3.58	875	2.43	225	1.89	40	2.45	235	......	......
16,	3.11	630	2.41	215	2.92	508	3.38	775	3.13	642	1.89	40	2.35	190	......	......
17,	3.41	790	2.41	215	2.92	508	3.08	612	2.93	514	1.89	40	2.20	130	......	......
18,	3.51	840	2.36	194	2.87	474	2.88	481	2.48	250	1.89	40	2.15	112	......	......
19,	3.31	740	2.36	194	2.82	439	2.68	354	2.43	225	2.04	75	2.15	112	......	......
20,	3.11	630	2.41	215	2.82	439	2.58	300	2.43	225	1.99	60	2.05	78	......	......
21,	3.16	658	2.61	316	2.82	439	2.48	250	2.63	326	1.99	60	2.00	62	......	......
22,	2.91	502	3.11	630	2.77	407	2.43	225	3.03	580	1.94	49	2.00	62	......	......
23,	3.01	566	2.96	534	2.77	407	2.43	225	4.38	1250	1.94	49	1.95	52	......	......
24,	4.06	1100	2.86	467	2.77	407	2.38	202	3.73	950	1.94	49	1.90	41	......	......
25,	3.51	840	2.71	371	2.72	377	2.38	202	3.33	750	1.89	40	2.05	78	......	......
26,	3.21	686	2.61	316	4.17	1150	2.33	182	3.13	642	1.89	40	1.95	52	......	......
27,	3.01	566	2.61	316	5.22	......	2.33	182	5.08	......	2.29	166	1.85	34	......	......
28,	2.81	432	3.71	940	3.92	1040	2.28	162	4.03	1090	2.19	126	1.80	26	......	......
29,	2.66	343	......	......	3.42	795	2.23	142	3.53	850	2.14	109	1.75	21	......	......
30,	2.56	290	......	......	3.12	636	2.33	182	3.28	724	2.09	92	1.70	16	......	......
31,	2.76	401	......	......	3.02	573	....	......	3.43	800	......	......	1.70	16	......	......

Note—All gage heights above 4-7 feet subject to backwater, therefore no discharge above this gage height has been published. *Station discontinued at Confluence and re-established August 12 at Ursina.

ESTIMATED MONTHLY DISCHARGE OF LAUREL HILL CREEK, AT CONFLUENCE, SOMERSET COUNTY, PA.

(Drainage area 126 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	....	290	....	....	....
February,	940	116	307	2.437	2.538
March,	....	270	....	....	....
April,	925	142	399	3.167	3.534
May,	....	106	....	....	....
June,	554	40	169	1.341	1.496
July,	235	12	57	0.453	0.522

Note—All gage heights above 4-7 feet subject to backwater, therefore no discharge above this gage height has been published. Station discontinued at Confluence and re-established August 12, at Ursina.

OHIO BASIN—STATION NO. 27.

YOUGHIOGHENY RIVER AT CONNELLSVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On two span, steel, through-truss, highway bridge from Connellsville to New Haven, Fayette county, Pa.

RECORDS AVAILABLE—Discharge complete from July 22, 1908, to December 31, 1913.

DRAINAGE AREA—1,320 square miles.

GAGE—A standard chain gage is bolted to the downstream handrail on the New Haven span. The elevation of zero is 860.131 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 34.20 feet. Bench Mark No. 1 is a chiseled point on projecting stone in retaining wall on New Haven side, below bridge; lowest stone at point, "B. M." chiseled into stone above; elevation 864.656 feet above mean sea level. Bench Mark No. 2 is U. S. G. S. bronze tablet on upstream end of pier of highway bridge; pier between B. & O. Railroad tracks; elevation 884.686 feet above mean sea level. The gage is read twice daily by D. H. Flick.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge. At extreme low water by wading at a section 600 feet above B. & O. pumping station, which is situated on the right bank about one mile above the bridge. The initial point for soundings in first span is point on downstream handrail directly above face of concrete retaining wall at B. & O. tracks. In second span it is a bend in handrail over second pier.

CHANNEL—The channel is straight for one-half mile above the station, with a riffle 600 feet upstream. The channel below the station is straight for 600 feet a railroad bridge crossing the stream about 500 feet downstream. The right bank is high and not subject to overflow on account of the B. & O. tracks and retaining wall along this side. The left bank is high and not subject to overflow. The bed is composed of rocks, gravel and mud.

DISCHARGE MEASUREMENTS OF YOUGHIOGHENY RIVER, AT CONNELLSVILLE, FAYETTE COUNTY, PA.

(Drainage area 1320 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913.		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
17	Aug. 15	Boehringer.	241	823	0.70	1.52	577	0.6 msmt.

DISCHARGE TABLE FOR YOUGHIOGHENY RIVER, AT CONNELLSVILLE, FAYETTE COUNTY, FROM JULY 22, 1908.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec-ft.	Feet.	Sec-ft.	Feet.	Sec-ft.	Feet.	Sec-ft.	Feet.	Sec-ft.
.10	10	.70	1715	.40	6590	.10	14530	.80	25000
.20	20	.80	1855	.50	6820	.20	14860	.90	25440
.30	35	.90	2000	.60	7050	.30	15200	11.00	25880
.40	55	3.00	2145	.70	7280	.40	15550	.10	26320
.50	75	.10	2305	.80	7520	.50	15920	.20	26760
.60	100	.20	2470	.90	7780	.60	16290	.30	27200
.70	130	.30	2640	6.00	8040	.70	16660	.40	27650
.80	160	.40	2810	.10	8300	.80	17030	.50	28100
.90	200	.50	2980	.20	8580	.90	17400	.60	28550
1.00	250	.60	3150	.30	8860	9.00	17770	.70	29000
.10	300	.70	3325	.40	9150	.10	18140	.80	29470
.20	350	.80	3500	.50	9450	.20	18510	.90	29960
.30	410	.90	3680	.60	9750	.30	18890	12.00	30450
.40	475	4.00	3860	.70	10055	.40	19270	.10	30950
.50	545	.10	4040	.80	10360	.50	19650	.20	31450
.60	615	.20	4220	.90	10665	.60	20040	.30	31950
.70	690	.30	4400	7.00	10970	.70	20440	.40	32450
.80	770	.40	4580	.10	11280	.80	20840	.50	32950
.90	855	.50	4770	.20	11590	.90	21240	.60	33500
2.00	950	.60	4960	.30	11910	10.00	21640	.70	34050
.10	1045	.70	5155	.40	12230	.10	22040	.80	34600
.20	1145	.80	5350	.50	12550	.20	22450	.90	35150
.30	1250	.90	5545	.60	12880	.30	22860	13.00	35700
.40	1360	5.00	5740	.70	13210	.40	23270	.10	36300
.50	1470	.10	5950	.80	13540	.50	23690	.20	36850
.60	1590	.20	6160	.90	13870	.60	24120		
		.30	6370	8.00	14200	.70	24560		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF YOUGHIOGHENY RIVER, AT CONNELLSVILLE, FAYETTE COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1.	5.25	6260	3.65	3240	4.80	5350	3.95	3770	2.78	1830	6.50	9450	1.95	902	1.65	652	0.50	75	0.75	145	2.85	1930	2.38	1340
2, ...	4.32	4440	3.10	2300	4.25	4310	4.05	3950	2.55	1530	4.90	3540	1.80	770	1.42	489	0.50	75	0.88	192	2.45	1420	2.35	1300
3, ...	5.05	5840	3.10	2300	3.48	2950	5.18	6120	2.42	1380	4.12	4080	1.68	675	1.28	398	0.50	75	1.60	615	2.35	1300	2.40	1360
4, ...	6.05	8170	3.58	3120	3.55	3060	4.65	5060	2.32	1270	3.65	3240	1.58	601	1.10	300	0.45	65	2.30	1250	2.12	1060	2.35	1300
5, ...	5.20	6160	3.42	2840	3.32	2670	4.15	4130	2.22	1170	3.05	2220	1.40	475	0.95	225	0.32	39	1.95	902	2.10	1040	2.28	1250
6, ...	5.30	6370	3.20	2470	3.18	2440	3.80	3500	2.12	1060	2.85	1930	2.00	950	0.98	240	0.28	32	1.68	675	1.99	940	2.20	1140
7, ...	8.32	15300	2.65	1650	2.78	1830	3.40	2810	2.20	1140	2.70	1720	1.85	812	0.95	225	0.30	35	1.38	462	1.85	812	3.50	2980
8, ...	a12.91	35200	2.55	1530	2.40	1360	3.15	2390	2.09	1040	3.00	2140	1.65	652	1.00	250	0.58	95	1.15	325	1.80	770	5.00	5740
9, ...	9.58	20000	2.55	1530	3.05	2220	2.92	2030	1.92	874	2.80	1860	1.55	580	1.02	260	1.05	275	1.05	275	2.62	1620	4.25	4310
10, ...	6.88	10600	2.52	1490	3.40	2810	2.62	1620	1.76	738	2.25	1200	1.78	754	0.95	225	0.95	225	0.90	200	4.40	4580	3.72	3360
11, ...	6.18	8520	2.70	1720	4.28	4360	2.75	1780	1.81	778	2.20	1140	2.32	1270	1.10	300	0.85	180	1.00	250	3.65	3240	3.52	3010
12, ...	11.05	26100	4.75	5250	4.72	5190	3.50	2980	1.72	706	2.05	998	2.20	1140	1.25	380	0.75	145	1.35	412	3.45	2900	3.20	2470
13, ...	8.50	15900	3.25	2560	4.18	4180	3.95	3770	1.68	675	1.92	874	1.75	730	1.72	706	0.60	100	1.25	380	4.70	5160	2.98	2120
14, ...	6.48	9390	2.85	1930	4.48	4730	4.40	4580	1.70	690	1.88	838	2.25	1200	1.62	630	0.55	88	1.15	325	9.52	19700	2.90	2030
15, ...	5.28	6330	3.00	2140	5.00	5740	4.88	5510	2.06	1010	1.68	675	2.90	2000	1.45	510	0.58	95	1.08	290	8.40	15600	2.82	1880
16.	4.88	5510	2.95	2070	4.50	4770	5.20	6160	2.88	1970	1.65	652	3.50	2980	1.25	380	0.50	75	1.00	250	10.40	23300	2.78	1830
17, ...	5.18	6120	2.70	1720	4.05	3950	4.60	4960	3.10	2300	1.55	580	3.12	2340	1.10	300	0.52	80	0.95	225	9.45	19500	2.70	1720
18, ...	5.58	7000	2.45	1420	3.62	3180	4.05	3950	2.95	2070	1.50	545	3.00	2140	0.98	240	0.75	75	0.98	240	6.75	10200	2.65	1650
19, ...	5.40	6590	2.40	1360	3.38	2780	3.60	3150	2.74	1770	1.45	510	2.95	2070	0.92	210	0.95	225	1.05	275	5.40	6590	2.70	1720
20.	4.80	5350	2.72	1740	3.15	2390	3.12	2340	2.38	1340	1.48	531	2.30	1250	0.95	225	1.02	260	2.10	1040	4.52	4810	2.40	1360
21, ...	4.65	5060	3.15	2390	3.00	2140	3.05	2220	2.45	1420	1.78	754	2.05	998	1.01	255	1.38	462	3.20	2640	4.00	3860	2.42	1380
22, ...	4.48	4730	3.88	3640	3.05	2220	2.88	1970	4.10	4040	1.80	770	1.90	855	0.88	192	2.05	998	3.30	2640	3.65	3240	2.68	1690
23, ...	4.32	4440	3.90	3680	2.82	1880	2.70	1720	6.40	9150	1.75	730	1.70	690	0.85	180	1.90	855	2.60	1590	3.30	2640	2.88	1970
24, ...	6.32	8920	3.55	3060	2.60	1590	2.55	1530	8.68	16600	1.85	812	1.62	630	0.85	180	1.50	545	2.40	1360	3.08	2270	3.35	2720
25, ...	5.65	7160	3.05	2220	2.65	1650	2.38	1340	6.35	9000	2.15	1100	1.82	787	0.80	160	1.20	350	4.30	4400	2.85	1930	4.02	3900
26, ...	5.05	5840	2.85	1930	4.30	4400	2.29	1240	5.20	6160	2.95	2070	1.82	787	0.80	160	1.02	260	7.70	13200	2.68	1690	4.55	4860
27, ...	4.42	4620	3.05	2220	b7.98	14100	2.32	1270	7.15	11400	4.90	5540	1.65	652	0.75	145	0.85	180	5.85	7650	2.58	1570	4.42	4620
28, ...	4.10	4040	4.92	5580	7.02	11000	2.78	1830	8.90	17400	3.55	3060	1.48	531	0.72	136	0.80	160	4.40	4580	2.55	1530	3.85	3590
29, ...	3.72	3360	....	......	5.62	7100	3.12	2340	6.85	10500	2.68	1690	1.45	510	0.62	106	0.80	160	3.65	3240	2.58	1570	3.30	2640
30, ...	3.38	2780	....	......	4.85	5450	2.88	1970	5.50	6820	2.12	1060	1.38	462	0.58	95	0.75	145	3.08	2270	2.38	1340	2.95	2070
31, ...	3.48	2950	....	......	4.30	4400	....	......	7.40	12200	....	......	1.55	580	0.55	88	....	......	3.08	2270	......	......	2.95	1860

Note.—a=Max. 13.50′ at 4:30 p. m.=*38800 sec. ft. b=Max. 8.80′ at 4:45 p. m.=17000 sec. ft. *Estimated.

ESTIMATED MONTHLY DISCHARGE OF YOUGHIOGHENY RIVER, AT CONNELLSVILLE, FAYETTE COUNTY, PA.

(Drainage area 1320 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	*38800	2780	8680	6.576	7.581
February,	5580	1360	2470	1.871	1.948
March,	17000	1360	4070	3.083	3.554
April,	6160	1240	3070	2.326	2.595
May,	17400	675	4190	3.174	3.659
June,	9450	510	1940	1.470	1.640
July,	2980	462	1020	0.773	0.891
August,	706	88	285	0.216	0.249
September,	998	32	214	0.162	0.181
October,	13200	145	1760	1.333	1.537
November,	23300	770	4940	3.742	4.175
December,	5740	1140	2420	1.833	2.113
The year,	*38800	32	2920	2.213	30.123

*Estimated.

TURTLE CREEK.

DESCRIPTION OF BASIN.

Turtle creek, a tributary of the Monongahela river in Allegheny and Westmoreland counties, drains an area of approximately 145 square miles. Rising in the western part of Westmoreland county, it flows in a southwesterly direction along the Allegheny county line to where it is joined by its largest tributary, Brush creek, and thence through Allegheny county to its mouth, just above Braddock borough, a total distance of about 20 miles. The basin is fan-shaped and the area drained is a rolling, agricultural country, only seven per cent. being forested, the upper section being entirely devoted to farming, whereas the lower section, along the valley, is congested by railroads and industrial establishments. The entire watershed is densely inhabited, many large and prosperous boroughs lying along the stream. This stream rises at an elevation of approximately 756 feet, making the average slope about 25 feet per mile, but there are numerous stretches of this stream which are flat, showing only a slope of from 5 to 9 feet per mile. In the lower section the channel is filled to a considerable depth with silt. Only one borough receives a domestic water supply from a tributary of Turtle creek, although many manufacturing establishments use the water for industrial purposes.

The mean annual precipitation over this watershed is from 35 to 40 inches.

The discharge has been measured since December 1st, 1907, at East Pittsburgh, about 1½ miles above the mouth.

OHIO BASIN—STATION NO. 28.

TURTLE CREEK AT EAST PITTSBURGH, PA.

DESCRIPTION OF STATION.

LOCATION—On Cable Avenue Viaduct from Pennsylvania Railroad Depot to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

RECORDS AVAILABLE—Discharge complete from December 1st, 1907, to December 31, 1913.

DRAINAGE AREA—145 square miles.

GAGE—A chain gage is attached to the outer side of the downstream handrail. The elevation of zero is 722.88 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 40.27 feet. Bench Mark No. 1 is on top of right abutment, downstream corner, elevation 746.63 feet above mean sea level. The gage is read twice daily by an employee of the Westinghouse Electric and Mfg. Co.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the Cable Avenue Viaduct. The initial point for soundings is a point on the downstream handrail directly above top edge of coping of left bridge seat.

CHANNEL—The channel above and below the station is straight for 1,000 feet, being walled in on both sides. There is a low dam about 200 feet downstream from the bridge. Both banks are high and do not overflow except in high backwater floods from the Monongahela river. The bed is of gravel and muddy clay.

REMARKS—This station is within reach of backwater floods from the Monongahela river.

DISCHARGE MEASUREMENTS OF TURTLE CREEK, AT EAST PITTSBURGH, ALLEGHENY COUNTY, PA.

(Drainage area 145 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
	1913.		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
14	Aug. 15	Boehringer, ...	40	31	0.74	0.84	23	Wading msmt.

DISCHARGE TABLE FOR TURTLE CREEK, AT EAST PITTSBURGH, ALLEGHENY COUNTY, FROM DEC. 1, 1907.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
0.00	....	.20	315	.40	1235	.60	2730	.80	5010
.10	....	.30	345	.50	1290	.70	2820	.90	5120
.20	10	.40	380	.60	1345	.80	2910	9.00	5230
.30	11	.50	415	.70	1400	.90	3000	.10	5335
.40	12	.60	450	.80	1455	7.00	3100	.20	5440
.50	15	.70	485	.90	1510	.10	3200	.30	5545
.60	19	.80	520	5.00	1570	.20	3300	.40	5655
.70	24	.90	555	.10	1630	.30	3405	.50	5765
.80	30	3.00	595	.20	1690	.40	3510	.60	5875
.90	37	.10	635	.30	1750	.50	3615	.70	5985
1.00	45	.20	675	.40	1810	.60	3725	.80	6095
.10	60	.30	715	.50	1875	.70	3835	.90	6200
.20	75	.40	755	.60	1940	.80	3945	10.00	6305
.30	90	.50	800	.70	2005	.90	4055	.10	6410
.40	110	.60	845	.80	2075	8.00	4165	.20	6515
.50	130	.70	890	.90	2150	.10	4270	.30	6620
.60	150	.80	935	6.00	2225	.20	4375	.40	6725
.70	175	.90	980	.10	2300	.30	4480	.50	6830
.80	200	4.00	1025	.20	2380	.40	4585		
.90	225	.10	1075	.30	2465	.50	4690		
2.00	255	.20	1125	.40	2550	.60	4795		
.10	285	.30	1180	.50	2640	.70	4900		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF TURTLE CREEK, AT EAST PITTSBURGH, ALLEGHENY CO., PA.

1913.	JAN.		FEB.		MAR.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	2.10	285	1.72	180	2.20	315	1.90	225	1.26	84	1.80	200	0.92	39	1.17	70	1.44	118	0.95	41	1.30	90	2.10	285
2, ...	1.62	155	1.70	175	1.50	130	2.70	485	1.00	45	1.58	146	1.75	188	1.24	81	1.54	138	1.10	60	1.35	100	1.95	240
3, ...	2.36	366	1.58	146	1.82	205	1.55	140	1.15	68	1.45	120	1.00	45	1.25	82	1.54	138	1.30	90	1.45	120	2.00	255
4, ...	2.50	415	1.54	138	1.90	225	1.85	212	1.02	48	1.40	110	0.75	27	1.31	92	1.36	102	1.00	45	1.45	120	2.30	345
5, ...	2.20	315	1.20	75	1.75	188	1.35	100	1.00	45	1.55	140	0.67	22	1.36	102	1.05	52	1.05	52	1.40	110	2.05	270
6, ...	3.88	971	1.36	102	1.70	175	1.50	130	0.90	37	1.60	150	1.12	63	1.28	87	0.80	30	1.20	75	1.10	60	2.05	270
7, ...	4.70	1400	1.25	82	1.25	82	1.34	98	1.10	60	1.60	150	0.75	27	1.51	132	0.75	27	0.90	37	1.22	78	2.40	380
8, ...	9.22	5460	1.32	94	1.90	225	1.35	100	1.05	52	1.28	87	0.72	25	1.58	146	1.95	240	1.05	52	1.38	106	1.90	225
9, ...	....	*3940	1.27	86	1.68	170	1.32	94	1.18	72	1.45	120	0.80	30	1.48	126	1.50	130	1.20	75	1.42	114	1.90	225
10, ...	3.72	899	1.30	90	1.71	178	1.32	94	1.15	68	1.95	240	1.12	63	1.81	202	0.95	41	0.95	41	1.45	120	1.90	225
11, ...	5.62	1950	1.16	69	1.80	200	1.39	108	0.98	43	1.02	48	0.70	24	1.86	215	0.45	13	0.85	34	1.60	150	1.75	188
12, ...	....	*2000	1.22	78	1.73	182	1.42	114	1.18	72	1.55	140	0.49	15	1.64	160	0.30	11	0.95	41	1.70	175	1.75	188
13, ...	6.60	2730	1.27	86	1.75	188	1.34	98	1.22	78	1.10	60	0.52	16	1.31	92	0.22	10	1.00	45	3.00	595	2.02	261
14, ...	2.58	443	1.40	110	2.45	398	1.34	98	1.25	82	0.70	24	0.57	18	1.21	76	0.25	10	0.85	34	4.00	1020	2.25	330
15, ...	2.25	330	1.80	200	2.01	258	1.55	140	1.22	78	0.50	15	0.55	17	0.92	39	0.38	12	0.98	43	5.40	1810	1.85	212
16, ...	2.52	422	1.22	78	2.20	315	1.45	120	1.20	75	0.75	27	0.56	17	0.81	31	0.58	18	1.10	60	......	*900	1.85	212
17, ...	2.90	555	1.12	63	2.20	315	1.32	91	1.18	72	0.45	14	1.30	90	1.51	132	0.68	23	0.85	34	......	*600	1.62	155
18, ...	2.95	575	1.35	100	2.10	285	1.30	90	1.00	45	0.25	10	1.50	130	0.68	23	1.10	60	1.75	188	......	*400	1.70	175
19, ...	2.75	502	1.42	114	1.95	240	1.22	78	1.05	52	0.26	11	1.55	140	0.71	25	0.80	30	1.40	110	......	*300	1.75	188
20, ...	2.62	457	1.51	132	1.95	240	1.27	86	1.08	57	0.27	11	1.55	140	0.81	31	1.22	78	1.30	90	1.90	225	1.90	225
21, ...	2.80	520	2.00	255	2.04	267	1.22	78	1.20	75	0.44	13	1.45	120	0.86	34	1.28	87	1.65	162	2.00	255	1.85	212
22, ...	2.34	359	2.20	315	1.85	212	1.26	84	1.26	84	0.58	18	1.46	122	0.96	42	1.05	52	1.55	140	2.15	300	1.88	220
23, ...	3.74	908	1.46	122	2.00	255	1.36	102	1.31	92	0.62	20	1.48	126	3.01	599	1.55	140	1.30	90	2.05	270	2.05	270
24, ...	2.95	575	1.32	94	2.00	255	1.31	92	1.50	130	0.70	24	1.31	92	2.81	524	0.92	39	1.28	87	2.10	285	2.00	255
25, ...	2.65	468	1.52	134	2.50	415	1.31	92	1.60	150	0.95	41	1.18	72	2.06	273	1.00	45	1.10	60	1.75	188	1.82	205
26, ...	2.25	330	1.28	87	8.00	4160	1.38	106	1.18	72	0.70	24	1.18	72	1.81	202	1.10	60	1.00	45	1.80	200	2.00	255
27, ...	2.35	362	3.60	845	5.79	2070	1.31	92	1.41	112	0.82	31	1.20	75	1.64	160	1.28	87	1.32	94	1.85	212	2.08	279
28, ...	1.95	240	2.40	380	3.25	695	1.24	81	1.50	130	0.87	35	1.20	75	1.20	75	0.95	41	1.35	100	1.75	188	2.05	270
29, ...	1.78	195	....	......	2.35	362	1.23	80	1.59	148	0.86	34	1.21	76	1.36	102	1.00	45	1.45	120	1.95	240	1.85	212
30, ...	1.82	205	....	......	2.70	485	1.20	75	1.51	132	0.86	34	1.18	72	1.40	110	1.15	68	1.35	100	2.10	285	1.68	170
31, ...	1.98	249	....	......	2.55	432	....	......	1.75	188	....	......	1.12	63	1.46	122	....	......	1.35	100	......	......	1.85	212

*Backwater from Monongahela River and discharge estimated.

ESTIMATED MONTHLY DISCHARGE OF TURTLE CREEK, AT EAST PITTSBURGH, ALLEGHENY COUNTY, PA.

(Drainage area 145 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	5460	155	922	6.359	7.331
February,	845	63	158	1.090	1.135
March,	4160	82	456	3.145	3.626
April,	485	75	120	0.828	0.924
May,	188	37	82	0.566	0.653
June,	240	10	70	0.483	0.539
July,	188	16	68	0.469	0.541
August,	599	23	135	0.931	1.073
September,	240	10	65	0.448	0.500
October,	188	34	76	0.524	0.604
November,	1810	60	321	2.214	2.470
December,	380	155	239	1.648	1.900
The year,	5460	10	226	1.559	21.296

SHENANGO RIVER.

DESCRIPTION OF BASIN.

The Shenango river, which forms, with the Mahoning river, at a point about 5 miles south of New Castle, Lawrence county, the Beaver river, rises in the southwestern part of Crawford county, Pennsylvania, about 5 miles southeast of Conneaut Lake, in the Pymatuning Swamp. The general course of the stream is southerly with numerous large sweeps to the east and west, crossing once for a short distance into Ohio but immediately returning into Pennsylvania. The total length from the head of Pymatuning Swamp to the junction with the Mahoning river is approximately 80 miles and the drainage area above the mouth is 1,080 square miles, of which 793 are in Pennsylvania.

The main tributaries of the stream are the Little Shenango, which joins it at Greenville, from the east; Pymatuning creek, from the west, just above Sharpsville; Big Yankee run, from the west at South Sharon; Deer creek from the west just below Pulaski; and Neshannock creek, from the east at New Castle, the latter being by far the largest, draining approximately 243 square miles.

The upper portion of the watershed lies within the once glaciated area and the main river and its major tributaries all find their sources in extensive swamp areas, while their valleys are broad and flat. Descending the main stream, however, the valley becomes more narrow and the hillsides more abrupt until near the mouth the valley again becomes wide and flat. A large portion of the watershed is under cultivation and the timber areas, except in the swamps, are not extensive.

The slope of the stream through the swamp, for the first 20 miles of its course, is at approximately 2 feet per mile, becoming a little more rapid as it descends, its fall through Mercer county being about 3 feet per mile. The total slope from its source in Pymatuning Swamp, at elevation about 1,020, to its mouth, at elevation about 760, is 260 feet, or 3.25 feet per mile.

From Greenville northward the watershed is not thickly inhabited, but southward from this point industries are more or less congested and the valley is thickly populated, becoming more so as the mouth is approached. The principal towns along the main stream, going southward, are Jamestown, Greenville, Sharpsville, Sharon, South Sharon, or Farrell, Pulaski and New Castle, the combined population of which is approximately 75,000. Some of these towns obtain their water supply from the Shenango river and the stream is very largely used by the steel plants, railroads and other industries which are numerous in this valley. A small amount of water power only is developed on this stream, largely at grist and flour mills, the total installation not amounting to over 600 horsepower.

The mean annual precipitation over the upper portion of this watershed is about 40 inches, decreasing as the mouth is approached.

The discharge of the stream has been measured since September, 1909, at Sharon, Pa., and at Turnerville, Crawford county, since February 1, 1912. Additional stations were established in September and December, 1913, on the Shenango river at Sharpsville and the Little Shenango river at Salem.

OHIO BASIN—STATION NO. 29.

SHENANGO RIVER AT TURNERVILLE, PA.

DESCRIPTION OF STATION.

LOCATION—On single span, steel, through-truss, highway bridge at Turnerville, Crawford county, the bridge having a total span of 105 feet.

RECORDS AVAILABLE—Discharge complete from February 1, 1912, to December 31, 1913.

DRAINAGE AREA—152 square miles.

GAGE—A standard chain gage is fastened to the downstream handrail; the length of chain is 24.55 feet. The elevation of zero is 970 feet above mean sea level. Bench Mark No. 1 is a chisel mark on south end of east abutment, elevation 987.084 feet above mean sea level, or 17.084 feet above gage datum. The gage is read by S. A. Marvin, an automatic gage in connection with a weir above the bridge was established October 9, 1913, to supplement the gage heights at the highway bridge.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge and by wading at riffle during low stages. The initial point for soundings is top edge east abutment, downstream side.

CHANNEL—The channel is straight for 200 feet above and below the station. The right bank overflows during extreme floods, while the left bank is high and not subject to overflow. The bed is composed of gravel.

REMARKS—A staff gage, located on the downstream side of the east abutment and graduated from 0 to 10 feet, is read during frozen periods; the elevation of zero of this gage is 976 feet above mean sea level.

DISCHARGE TABLE FOR SHENANGO RIVER, AT TURNERVILLE, CRAWFORD COUNTY, FROM FEB. 1, 1912 TO DEC. 31, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
3.00	0.8	5.00	126	7.00	442	9.00	970	11.00	1682
.10	1	.10	138	.10	463	.10	1000	.10	1723
.20	1.5	.20	150	.20	485	.20	1030	.20	1764
.30	2	.30	162	.30	507	.30	1060	.30	1805
.40	3	.40	174	.40	530	.40	1090	.40	1850
.50	5	.50	187	.50	555	.50	1120	.50	1895
.60	7	.60	200	.60	580	.60	1155	.60	1940
.70	9	.70	214	.70	605	.70	1190	.70	1985
.80	12	.80	229	.80	630	.80	1225	.80	2030
.90	16	.90	244	.90	655	.90	1260	.90	2075
4.00	22	6.00	259	8.00	680	10.00	1296	12.00	2120
.10	31	.10	275	.10	707	.10	1333	.20	2215
.20	40	.20	291	.20	735	.20	1371	.40	2310
.30	49	.30	308	.30	763	.30	1409	.60	2410
.40	59	.40	325	.40	791	.40	1447	.80	2510
.50	69	.50	343	.50	820	.50	1485		
.60	80	.60	362	.60	850	.60	1523		
.70	91	.70	382	.70	880	.70	1562		
.80	102	.80	402	.80	910	.80	1602		
.90	114	.90	422	.90	940	.90	1642		

ICE DISCHARGE TABLE FOR SHENANGO RIVER, AT TURNERVILLE, CRAWFORD COUNTY, FROM FEB. 1, 1912 TO MAR. 20, 1912 AND FEB. 7 TO MAR. 9, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
3.00	0.8	.90	60	.80	329	.70	789	.60	1416
.10	1.0	5.00	68	.90	349	.80	818	.70	1453
.20	1.5	.10	76	7.00	369	.90	847	.80	1490
.30	2.0	.20	84	.10	389	9.00	877	.90	1529
.40	3	.30	94	.20	410	.10	908	11.00	1568
.50	3.5	.40	104	.30	431	.20	939	.10	1607
.60	4	.50	117	.40	453	.30	970	.20	1646
.70	6	.60	130	.50	477	.40	1002	.30	1686
.80	9	.70	143	.60	501	.50	1035	.40	1728
.90	12	.80	157	.70	525	.60	1068	.50	1770
4.00	15	.90	172	.80	550	.70	1101	.60	1812
.10	18	6.00	188	.90	575	.80	1135	.70	1854
.20	22	.10	204	8.00	600	.90	1169	.80	1896
.30	26	.20	220	.10	626	10.00	1203	.90	1940
.40	31	.30	237	.20	652	.10	1237	12.00	1984
.50	36	.40	254	.30	679	.20	1272	.10	2029
.60	41	.50	272	.40	706	.30	1308	.20	2074
.70	47	.60	290	.50	733	.40	1344	.30	2120
.80	53	.70	309	.60	761	.50	1380		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF SHENANGO RIVER, AT TURNERVILLE, CRAWFORD CO., PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	6.86	414	5.70	214	5.86	*166	7.44	540	4.97	122	4.44	63	6.32	311	3.97	20	3.70	9	3.76	11	4.85	108	4.81	103
2, ...	7.63	588	5.70	214	5.77	*153	6.83	408	5.01	127	4.41	60	5.80	229	3.89	16	3.70	9	3.81	12	4.81	103	4.79	101
3, ...	7.89	652	5.62	203	6.11	*206	6.55	352	4.87	110	4.47	66	5.32	164	3.85	14	3.69	9	3.85	14	4.71	92	4.75	96
4, ...	7.14	472	5.25	156	6.03	*193	6.30	308	4.71	92	4.65	86	4.96	121	3.84	14	3.65	8	4.12	33	4.73	94	4.70	91
5, ...	6.80	402	5.04	131	5.80	*157	6.18	288	4.52	71	4.81	103	5.14	143	3.80	12	3.65	8	4.27	46	4.70	91	4.68	89
6, ...	7.16	476	4.90	114	5.64	*135	6.10	275	4.37	56	4.85	108	5.88	241	3.80	12	3.65	8	4.12	33	4.58	78	4.61	81
7, ...	10.17	1360	4.89	*59	5.54	*122	5.93	248	4.23	43	4.76	98	6.12	278	3.80	12	3.65	8	3.92	17	4.45	64	4.72	93
8, ...	12.37	2300	4.72	*48	5.53	*121	5.61	201	4.14	35	4.58	78	6.89	420	3.80	12	3.65	8	3.80	12	4.41	60	4.99	125
9, ...	11.87	2060	4.58	*40	5.16	*145	5.35	168	4.10	31	4.57	77	7.08	459	3.80	12	3.65	8	3.75	10	4.40	59	4.99	125
10, ...	11.02	1690	4.49	*36	7.16	476	5.20	150	4.08	29	4.66	87	6.78	398	3.83	13	3.65	8	3.76	11	4.40	59	5.03	130
11, ...	10.37	1440	4.45	*34	8.55	835	5.42	177	4.04	26	4.69	90	6.31	310	3.89	16	3.64	8	3.76	11	4.49	68	5.28	160
12, ...	10.90	1640	4.38	*30	9.49	1120	5.63	204	4.00	22	4.59	79	5.88	241	3.84	14	3.60	7	3.76	11	4.79	101	5.20	150
13, ...	10.61	1530	4.30	*26	9.07	991	5.81	230	4.00	22	4.35	54	5.54	192	3.78	11	3.60	7	3.80	12	6.54	351	5.39	173
14, ...	9.69	1190	4.27	*25	8.49	817	5.95	252	4.00	22	4.11	32	5.24	155	3.75	10	3.60	7	3.84	14	9.75	1210	5.54	192
15, ...	8.13	715	4.20	*22	7.95	668	5.64	206	4.04	26	3.98	21	5.02	128	3.75	10	3.60	7	3.84	14	11.63	1950	5.44	179
16, ...	7.81	632	4.20	*22	7.40	530	5.30	162	4.23	43	3.95	19	4.88	112	3.74	10	3.60	7	3.80	12	11.21	1770	5.53	191
17, ...	9.96	1280	4.20	*22	6.85	412	5.08	136	4.37	56	3.94	18	4.88	112	3.69	9	3.61	7	3.79	12	9.69	1190	5.05	132
18, ...	11.23	1780	4.20	*22	6.32	311	4.96	121	4.40	59	3.89	16	4.91	115	3.69	9	3.66	8	3.80	12	8.19	732	5.34	167
19, ...	11.30	1800	4.25	*24	5.96	253	4.83	106	4.31	50	3.86	14	4.66	87	3.70	9	3.83	13	3.81	12	7.48	550	5.15	144
20, ...	10.70	1560	4.56	*39	5.76	223	4.74	95	4.18	38	3.92	17	4.48	67	3.70	9	4.04	26	3.93	18	7.12	467	4.85	108
21, ...	10.13	1340	4.94	*63	5.50	187	4.62	82	4.11	32	3.98	21	4.33	52	3.67	8	3.97	20	4.13	34	6.88	418	5.00	126
22, ...	9.27	1050	5.30	*94	5.23	154	4.52	71	4.05	26	4.15	36	4.18	38	3.75	10	3.87	15	4.28	47	6.48	339	4.91	115
23, ...	8.85	925	5.73	*147	6.68	378	4.44	63	4.06	27	4.24	44	4.10	31	3.78	11	3.87	15	4.26	45	6.12	278	4.86	109
24, ...	9.73	1200	5.54	*122	10.43	1460	4.38	57	4.10	31	4.19	39	4.06	27	3.92	17	3.79	12	4.40	59	5.92	247	5.51	188
25, ...	9.47	1110	5.77	*153	15.27	4510	4.28	47	4.08	29	4.15	36	4.06	27	3.97	20	3.75	10	4.74	95	5.60	200	5.46	182
26, ...	8.28	757	5.70	*143	15.98	5110	4.25	44	4.05	26	4.92	116	4.05	26	3.88	15	3.74	10	4.76	98	5.31	163	5.54	192
27, ...	7.33	514	5.53	*121	14.60	3860	4.31	50	4.07	28	5.83	234	4.02	24	3.79	12	3.70	9	4.76	98	5.13	142	5.78	226
28, ...	6.70	382	6.04	*194	12.82	2520	4.54	73	4.23	43	6.20	291	4.12	33	3.75	10	3.70	9	4.90	114	5.03	130	5.77	224
29, ...	6.17	286	....	......	11.01	1690	4.84	107	4.41	60	7.00	442	4.20	40	3.78	11	3.70	9	5.00	126	4.92	116	5.40	174
30, ...	5.81	230	....	......	9.29	1060	4.82	104	4.46	65	6.86	414	4.17	37	3.75	10	3.71	9	4.99	125	4.88	112	5.19	149
31, ...	5.74	220	....	......	8.16	724	....	......	4.48	67	....	......	4.04	26	3.74	10	....	......	4.93	118	......	......	5.04	131

*Ice cover.

ESTIMATED MONTHLY DISCHARGE OF SHENANGO RIVER, AT TURNERVILLE, CRAWFORD COUNTY, PA.

(Drainage area 152 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	2300	220	1030	6.776	7.812
February,	....	....	90	0.592	0.616
March,	5100	....	958	6.303	7.267
April,	540	44	178	1.171	1.306
May,	127	22	49	0.322	0.371
June,	442	14	95	0.625	0.698
July,	459	24	150	0.987	1.138
August,	20	8	12	0.079	0.091
September,	26	7	10	0.066	0.074
October,	126	10	41	0.270	0.311
November,	1950	59	378	2.487	2.775
December,	226	81	143	0.941	1.085
The year,	5100	7	261	1.718	23.544

Note.—Feb. 7th to March 9th river frozen, discharge taken from ice curve.

OHIO BASIN—STATION NO. 30.

SHENANGO RIVER AT SHARON, PA.

DESCRIPTION OF STATION.

LOCATION—At single span, steel, through-truss highway bridge at Chestnut Street, Sharon, Mercer Co.

RECORDS AVAILABLE—Discharge complete from August 1, 1909, to December 31, 1913.

DRAINAGE AREA—611 square miles.

GAGE—A staff gage was originally fastened to cribbing on the right bank of the river about fifty feet above the Chestnut Street bridge. This gage, however, was washed out by high water and since then the gage heights have been obtained by measuring from the handrail to the water surface with a steel tape and plumb-bob. The elevation of zero of the staff gage was 840 feet above mean sea level. Bench Mark No. 1 is U. S. G. S. bronze tablet on southeast abutment of Chestnut Street bridge, elevation 855.92 feet above mean sea level. The gage heights are obtained by employes of the Carnegie Steel Company.

DISCHARGE MEASUREMENTS—Taken from Mill Street and State Street bridges. The initial point for soundings on the Mill Street bridge is end of handrail, right side, looking downstream (measurements from upstream side). The inital point on the State Street bridge is top of left abutment (measurements from the downstream side). During former years discharge measurements were taken from the Carnegie Plate Girder bridge, and the Upper Wheatland bridge.

CHANNEL—The channel is straight above and below the station for 500 feet. The banks are approximately 12 feet above the river bed. The bed is composed of gravel and dirt.

DISCHARGE TABLE FOR SHENANGO RIVER, AT SHARON, MERCER COUNTY, FROM AUG. 1, 1909 TO MARCH 23, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.70	20	.10	655	.50	2190	.90	5535	.30	10478
.80	23	.20	700	.60	2280	9.00	5740	.40	10684
.90	27	.30	745	.70	2375	.10	5946	.50	10890
2.00	30	.40	792	.80	2470	.20	6152	.60	11096
.10	37	.50	840	.90	2575	.30	6358	.70	11302
.20	46	.60	890	7.00	2680	.40	6564	.80	11508
.30	63	.70	940	.10	2790	.50	6770	.90	11714
.40	87	.80	990	.20	2900	.60	6976	12.00	11920
.50	112	.90	1040	.30	3020	.70	7182	.10	12126
.60	138	5.00	1095	.40	3140	.80	7388	.20	12332
.70	164	.10	1150	.50	3270	.90	7594	.30	12538
.80	190	.20	1210	.60	3400	10.00	7800	.40	12744
.90	218	.30	1270	.70	3535	.10	8006	.50	12950
3.00	248	.40	1335	.80	3670	.20	8212	.60	13156
.10	278	.50	1400	.90	3815	.30	8418	.70	13362
.20	310	.60	1470	8.00	3960	.40	8624	.80	13568
.30	343	.70	1540	.10	4120	.50	8830	.90	13774
.40	376	.80	1610	.20	4280	.60	9036	13.00	13980
.50	411	.90	1685	.30	4440	.70	9242	.50	15010
.60	448	6.00	1760	.40	4610	.80	9448	14.00	16040
.70	486	.10	1840	.50	4780	.90	9654	.50	17070
.80	527	.20	1920	.60	4960	11.00	9860	15.00	18100
.90	569	.30	2010	.70	5150	.10	10066	.50	19140
4.00	612	.40	2100	.80	5240	.20	10272	16.00	20160

DISCHARGE TABLE FOR SHENANGO RIVER, AT SHARON, MERCER COUNTY, FROM MARCH 24, 1913 TO DEC. 31, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
1.70	20	.40	805	.10	2670	.80	5690	.50	11330
.80	23	.50	858	.20	2765	.90	5840	.60	11564
.90	26	.60	911	.30	2860	10.00	6000	.70	11798
2.00	31	.70	965	.40	2955	.10	6170	.80	12032
.10	40	.80	1020	.50	3050	.20	6340	.90	12266
.20	52	.90	1077	.60	3145	.30	6515	13.00	12500
.30	67	5.00	1133	.70	3240	.40	6700	.10	12734
.40	84	.10	1192	.80	3340	.50	6890	.20	12968
.50	104	.20	1251	.90	3440	.60	7100	.30	13202
.60	127	.30	1311	8.00	3540	.70	7310	.40	13436
.70	153	.40	1374	.10	3640	.80	7520	.50	13670
.80	180	.50	1438	.20	3743	.90	7730	.60	13904
.90	208	.60	1502	.30	3850	11.00	7940	.70	14138
3.00	237	.70	1570	.40	3960	.10	8160	.80	14372
.10	267	.80	1638	.50	4070	.20	8380	.90	14606
.20	297	.90	1707	.60	4180	.30	8600	14.00	14840
.30	328	6.00	1777	.70	4290	.40	8820	.10	15074
.40	360	.10	1850	.80	4405	.50	9040	.20	15308
.50	396	.20	1922	.90	4525	.60	9260	.30	15542
.60	432	.30	2000	9.00	4645	.70	9480	.40	15776
.70	472	.40	2078	.10	4768	.80	9700	.50	16010
.80	513	.50	2155	.20	4890	.90	9930	.60	16244
.90	559	.60	2239	.30	5015	12.00	10160	.70	16478
4.00	605	.70	2321	.40	5145	.10	10394	.80	16712
.10	654	.80	2405	.50	5280	.20	10628	.90	16946
.20	702	.90	2491	.60	5413	.30	10862	15.00	17180
.30	753	7.00	2578	.70	5550	.40	11096		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF SHENANGO RIVER, AT SHARON, MERCER COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	5.74	1570	4.35	768	5.56	1440	6.19	1910	3.49	392	2.83	188	3.86	541	2.28	64	1.96	29	2.16	47	2.94	220	3.23	306
2, ...	5.26	1250	3.67	475	4.72	950	5.47	1420	3.35	344	2.76	169	3.58	425	2.24	58	1.95	28	2.15	46	2.82	186	3.22	303
3, ...	5.44	1360	3.66	471	4.47	826	5.17	1230	3.23	306	2.77	172	3.29	325	2.19	51	1.93	30	2.26	61	2.72	158	3.19	294
4, ...	5.27	1250	3.65	467	4.70	940	4.93	1090	3.11	270	2.64	137	3.00	237	2.12	42	1.99	30	2.28	64	2.74	164	3.15	282
5, ...	5.01	1100	3.48	404	4.88	1030	4.74	987	2.97	228	2.59	125	2.86	197	2.06	36	1.96	29	2.28	64	2.69	150	3.10	267
6, ...	5.69	1530	3.28	336	4.69	935	4.44	826	2.85	194	2.69	150	3.23	306	2.12	42	1.91	26	2.21	54	2.67	145	3.04	249
7, ...	8.41	4630	3.12	284	4.27	732	4.25	728	2.76	169	2.72	158	3.56	418	2.04	35	1.88	25	2.21	54	2.60	127	3.08	261
8, ...	10.63	9100	3.10	278	3.88	561	4.07	639	2.72	158	2.63	135	3.61	436	2.08	38	1.88	25	2.27	62	2.60	127	3.38	354
9.	11.23	10300	3.12	284	4.17	686	3.85	536	2.68	148	2.55	116	3.77	501	2.05	36	1.89	26	2.19	51	2.78	175	3.61	436
10.	9.04	5820	3.06	266	5.65	1500	3.66	456	2.62	132	2.56	118	4.15	678	2.08	38	1.91	26	2.26	61	3.24	309	3.61	436
11, ...	8.98	5700	3.04	260	6.24	1960	4.11	659	2.51	106	2.63	135	3.73	484	2.30	67	1.91	26	2.10	40	3.62	440	3.67	460
12, ...	9.85	7490	2.94	230	6.54	2230	4.50	858	2.37	79	2.60	127	3.44	374	2.14	45	1.89	26	2.09	39	3.73	484	3.51	400
13, ...	9.08	5900	2.86	207	6.65	2330	4.50	858	2.46	96	2.58	122	3.61	436	2.02	33	1.89	26	2.07	37	5.15	1220	3.74	488
14, ...	7.35	3080	2.84	201	6.80	2470	4.62	922	2.53	111	2.51	106	3.31	331	1.90	26	1.89	26	2.04	35	8.11	3650	3.94	577
15, ...	6.25	1960	2.84	201	6.42	2120	4.52	869	2.50	104	2.27	62	3.04	249	1.86	25	1.82	24	2.04	35	8.87	4490	4.08	644
16.	6.21	1930	2.86	207	5.73	1560	4.18	692	2.74	164	2.10	40	2.66	143	1.97	30	1.84	24	2.07	37	9.03	4680	3.96	587
17, ...	9.13	6010	2.83	198	5.16	1190	3.76	497	2.98	231	2.26	61	2.67	145	1.90	26	1.88	25	2.03	34	7.97	3510	3.84	531
18, ...	9.97	7740	2.88	212	4.75	965	3.53	407	2.92	214	2.17	48	3.62	440	1.78	22	2.02	33	2.12	42	6.51	2160	3.76	497
19, ...	9.51	6790	2.83	198	4.39	787	3.38	354	2.78	175	2.10	40	3.04	249	1.78	22	1.99	30	2.09	39	5.74	1660	3.60	432
20, ...	8.52	4820	3.03	257	4.09	651	3.29	325	2.72	158	2.11	41	2.76	169	1.81	23	1.91	26	2.07	37	5.39	1370	3.33	338
21, ...	8.28	4410	3.45	394	3.87	556	3.15	282	2.64	137	2.19	51	2.63	135	1.82	24	1.98	30	2.27	62	5.07	1170	3.22	303
22, ...	7.89	3800	4.03	625	3.59	444	3.03	246	2.82	186	2.33	72	2.55	116	1.87	25	2.00	31	2.48	100	4.73	982	3.28	322
23, ...	7.99	3950	4.74	960	3.76	511	2.99	234	2.98	231	2.41	86	2.34	74	1.90	26	1.95	28	2.64	137	4.40	805	3.31	331
24, ...	8.46	4710	4.17	686	8.85	4460	2.93	217	2.68	148	2.43	90	2.23	56	2.02	33	2.07	37	2.77	172	4.13	668	3.81	518
25.	7.65	3470	3.82	535	15.29	17400	2.90	208	2.63	135	2.36	77	2.37	79	2.04	35	2.12	42	3.18	291	3.83	527	4.21	707
26.	6.53	2220	3.73	498	18.05	23400	2.82	186	2.52	109	2.78	175	2.37	79	2.00	31	2.01	32	3.83	527	3.57	421	4.03	620
27, ...	5.76	1580	4.70	940	16.16	19300	2.95	222	2.76	169	3.30	328	2.46	96	2.07	37	2.00	31	3.58	425	3.40	360	3.56	418
28.	5.10	1150	6.28	1990	13.79	14300	3.32	334	3.55	414	3.38	354	2.46	96	2.02	33	2.06	36	3.25	312	3.31	331	3.56	418
29.	4.66	920	....	......	10.81	7540	3.68	464	3.69	468	3.48	389	2.42	88	2.08	33	2.01	32	3.11	270	3.19	294	3.75	492
30.	4.32	754	....	......	8.14	3680	3.69	468	3.57	421	3.85	536	2.30	67	2.16	47	2.00	31	3.07	258	3.21	300	3.61	436
31, ...	4.39	787	....	......	6.80	2400	....	......	3.01	240	....	......	2.36	77	2.04	35	....	......	3.03	246	......	......	3.56	418

ESTIMATED MONTHLY DISCHARGE OF SHENANGO RIVER, AT SHARON, MERCER COUNTY, PA.

(Drainage area 611 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	10300	754	3780	6.187	7.133
February,	1990	198	458	0.750	0.781
March,	23400	444	3870	6.334	7.302
April,	1910	186	637	1.043	1.163
May,	468	79	208	0.340	0.392
June,	536	40	147	0.241	0.269
July,	541	56	260	0.426	0.491
August,	67	22	36	0.059	0.068
September,	42	24	29	0.047	0.053
October,	527	34	121	0.198	0.229
November,	4680	127	1040	1.702	1.899
December,	707	249	423	0.692	0.797
The year,	23400	22	917	1.502	20.577

NESHANNOCK CREEK.

DESCRIPTION OF BASIN.

Neshannock creek, the largest tributary of the Shenango river, drains approximately 245 square miles in Mercer and Lawrence counties. Rising in and passing through numerous extensive swamp areas, in the central and eastern parts of Mercer county, its two branches, Otter and Mill creeks, join near Mercer borough, and the main stream then follows a general southerly direction for about 23 miles to its mouth at New Castle, Lawrence county, the general outline of the watershed being pear shaped. The upper sections of this stream in Mercer county flow through a deforested, rolling country, in which farming and some bituminous coal mining is carried on. The stream is sluggish in its upper portions, and the basin is covered to a great depth by deposits of glacial drift, but upon entering Lawrence county, it becomes a rapid stream, with numerous falls, flowing through a narrow gorge with high, steep walls of sandstone. From Hope Mills, Mercer county, (elevation, 1,107 feet) to New Castle, (elevation, 799 feet), a distance of 20 miles, the rate of flow is about 15 feet per mile. The chief tributaries are Otter, Mill and Little Neshannock creeks. Numerous boroughs, farming and mining villages lie in this basin, but the stream is not used for domestic water supply, and, to a limited extent, for industrial purposes, by plants in the vicinity of its mouth.

The mean annual precipitation over this watershed is from 35 to 45 inches.

The discharge has been measured since August 9, 1909, at New Castle, Pennsylvania, near the mouth.

OHIO BASIN—STATION NO. 31.

NESHANNOCK CREEK AT NEW CASTLE, PA.

DESCRIPTION OF STATION.

LOCATION—On Jefferson Street bridge, New Castle, Lawrence Co.

RECORDS AVAILABLE—Discharge complete from August 9, 1909, to December 31, 1911, and discharge measurements and gage heights from January 1, 1912 to December 31, 1913.

DRAINAGE AREA—240 square miles.

GAGE—A standard chain gage is fastened to the downstream handrail of the bridge. The elevation of zero is arbitrary. The length of chain from the bottom of the weight to the marker is 19.55 feet. Bench Mark No. 1 is a cross on the bridge wall, left side of bridge, elevation 6.82 feet above gage datum. Bench Mark No. 2 is a cross within a quarter circle on the outer downstream corner of the right bridge seat, elevation 14.53 feet above gage datum. The gage is read twice daily by an employee of the Carnegie Steel Company.

DISCHARGE MEASUREMENTS—Taken from the downstream side of the bridge and by wading either above or below the bridge. The initial point for soundings is face of left abutment, downstream side of bridge.

CHANNEL—The channel above and below the station is straight for ¼ mile and 300 yards respectively. Both banks are high but overflow during extreme high water. The bed is composed of stones, mud and slime.

REMARKS—At extreme high stages in the Shenango river the water may be backed to near the Jefferson Street Bridge.

DISCHARGE MEASUREMENTS OF NESHANNOCK CREEK, AT NEW CASTLE, LAWRENCE COUNTY, PA.

(Drainage area 240 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
17	1913 Aug. 25	Boehringer, ...	36	32	1.19	1.93	38	0.6 msmt.

DAILY MEAN GAGE HEIGHTS OF NESHANNOCK CREEK, AT NEW CASTLE, LAWRENCE CO., PA.

1913	JAN.	FEB.	MARCH.	APRIL	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.
DAY.	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H	G H
1,	3.74	3.36	4.42	4.68	3.00	2.74	2.05	2.17	1.92	2.00	2.98	2.93
2,	3.30	2.95	3.81	4.21	2.84	2.68	2.13	2.12	1.85	2.14	2.85	2.95
3,	3.32	2.71	3.12	4.44	2.80	2.59	2.33	2.27	1.83	2.11	2.58	2.98
4,	2.96	†2.66	3.30	4.30	2.72	2.36	2.99	2.22	1.77	1.99	2.45	2.96
5,	3.05	†2.23	3.45	4.67	2.63	2.24	5.01	2.01	1.79	1.94	2.32	2.89
6,	3.72	†2.24	3.34	4.17	2.55	2.18	4.33	1.96	1.76	1.95	2.22	2.70
7,	6.20	†2.36	2.44	3.72	2.46	2.22	2.73	2.05	1.81	2.09	2.14	2.90
8,	8.27	†2.26	2.66	3.62	2.36	2.20	2.19	2.05	1.79	2.07	2.12	3.12
9,	5.42	†2.20	3.24	3.52	2.42	2.16	2.39	2.08	1.81	2.04	1.98	2.94
10,	4.09	†2.33	3.95	3.43	2.40	2.20	3.99	2.42	1.79	2.13	2.05	2.83
11,	5.36	2.35	4.26	4.05	2.40	2.20	3.03	3.37	1.81	2.06	2.22	2.87
12,	6.90	2.30	3.88	3.94	2.41	2.18	2.64	2.43	1.85	2.01	3.50	2.60
13,	4.86	2.09	3.76	4.05	2.42	2.12	2.44	2.14	1.87	1.97	4.76	2.75
14,	3.94	2.12	4.55	4.08	2.36	1.96	2.33	2.08	1.79	1.95	7.12	2.84
15,	3.50	1.97	4.22	3.98	2.54	1.83	2.13	2.08	1.78	1.92	6.05	3.02
16,	3.70	2.02	3.85	3.58	2.96	1.98	2.04	1.95	1.79	2.31	5.17	2.85
17,	7.10	2.06	3.25	3.32	2.82	2.02	2.38	1.86	1.84	2.31	4.30	2.80
18,	6.10	2.09	3.02	3.15	2.50	2.03	2.29	1.97	1.79	2.29	4.06	2.76
19,	4.92	2.25	2.94	3.04	2.48	2.02	2.25	2.08	1.81	2.30	4.08	2.72
20,	4.12	2.68	2.82	2.98	2.26	2.04	2.15	1.82	1.89	2.31	4.05	2.70
21,	4.96	2.92	2.76	2.90	2.28	2.80	2.06	2.04	1.91	2.33	3.84	2.66
22,	4.21	3.28	2.62	2.88	2.51	2.42	2.00	2.17	1.97	2.28	3.53	2.62
23,	4.92	3.23	2.99	2.84	2.81	2.30	1.97	1.95	1.96	2.29	3.32	2.66
24,	5.68	2.90	5.88	2.82	2.78	2.09	2.26	1.90	1.89	2.43	3.22	2.68
25,	4.52	2.42	*13.08	2.80	2.58	2.05	2.56	1.94	1.83	3.64	3.02	2.92
26,	3.92	2.36	*14.99	2.80	2.46	2.44	2.22	2.03	1.77	3.49	2.92	3.11
27,	3.54	3.45	*14.38	2.95	2.80	2.46	2.07	1.99	1.73	3.21	2.87	3.06
28,	3.25	5.58	*9.41	3.60	4.56	2.17	2.38	1.80	1.75	3.35	2.84	3.19
29,	3.06	....	5.72	3.86	3.80	2.04	2.29	1.90	1.94	3.29	2.90	3.23
30,	3.02	....	4.92	3.45	3.28	2.02	2.32	2.05	1.94	3.35	2.90	3.08
31,	3.52	....	4.78	....	3.02	....	2.19	1.88	....	3.09	....	3.10

*Back water from Shenango River. †Creek frozen at gage.

SLIPPERY ROCK CREEK.

DESCRIPTION OF BASIN.

Slippery Rock creek, the largest tributary of Connoquenessing creek, drains approximately 403 square miles in Butler, Mercer and Lawrence counties. Several branches rise in the north central portion of Butler county, and come together to form the main stream near Branchton, Butler county. The main stream flows in a general southwesterly direction following a tortuous course, its total length being approximately 43 miles. In the central section of the stream the valleys are broad and largely cultivated, as are the hills, the current being sluggish and flowing between gently sloping banks, with wide plains bordering it on either side. After the stream enters Lawrence county, the broad valleys contract to a narrow gorge, and the low sloping banks are replaced by high cliffs of massive sandstone, and the hitherto gently flowing streams becomes a rapid torrent.

The elevation of the stream at its source is approximately 1,400 feet above mean sea level, and, at Kiesters, 14 miles below, the elevation is 1,150 feet, producing a slope of 18 feet per mile. From Kiesters to Kennedy's Mill, elevation 1,040, the stream flows through a gently sloping valley for a distance of 17 miles, having a slope of approximately 6 feet per mile. After leaving Kennedy's Mill, the creek enters the gorge which continues almost to its mouth, (elevation 580 feet) a distance of approximately 12 miles, with a fall of approximately 39 feet.

The only tributary of any importance is Muddy creek, which enters it from the east in Butler county, although there are many small tributaries entering it in Lawrence, Butler and Mercer counties.

The domestic water supply for Ellwood City and vicinity is obtained from Slippery Rock creek at its mouth. The water power of the creek is used by numerous grist mills.

The mean annual precipitation over the headwaters of the stream is from 40 to 45 inches, and over the lower reaches from 35 to 40 inches.

The discharge has been measured since January 1, 1912, near Wurtemburg, approximately 2 miles above the mouth.

OHIO BASIN—STATION NO. 32.

SLIPPERY ROCK CREEK AT WURTEMBURG, PA.

DESCRIPTION OF STATION.

LOCATION—On highway bridge across Slippery Rock creek at the north end of Wurtemburg, Lawrence Co.

RECORDS AVAILABLE—Discharge complete from January 1, 1912, to December 31, 1913.

DRAINAGE AREA—400 square miles.

GAGE—A standard chain gage is fastened to the upstream side of the bridge. The elevation of zero is 817.63 feet above mean sea level. The length of chain from the bottom of the weight to the marker is 36.00 feet. Bench Mark No. 1 is the U. S. Geological Survey bench in northwest abutment (aluminum tablet stamped "851 ADJ 1903,") elevation 850.231 feet above mean sea level. The gage is read twice daily by Jacob Boots.

DISCHARGE MEASUREMENTS—Taken from the upstream side of the bridge. The initial point for soundings is the west end of the north guardrail.

CHANNEL—The channel above and below the station is straight for one-half mile above and 600 feet below. Both banks rise abruptly. The bed is composed of gravel.

DISCHARGE MEASUREMENTS OF SLIPPERY ROCK CREEK, AT WURTEMBURG, LAWRENCE COUNTY, PA.

(Drainage area 400 square miles.)

No.	Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Remarks.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.	
	1913							
19	Aug. 24	Boehringer, ...	38	29	1.59	2.27	46	Wading 300′ below bridge.

DISCHARGE TABLE FOR SLIPPERY ROCK CREEK, AT WURTEMBURG, LAWRENCE COUNTY, FROM JAN. 1, 1912.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.	Feet.	Sec. ft.
2.00	20	.10	610	.20	1700	.30	3350	.40	5730
.10	30	.20	690	.30	1820	.40	3530	.50	5980
.20	50	.30	770	.40	1950	.50	3720	.60	6240
.30	80	.40	860	.50	2080	.60	3910	.70	6510
.40	130	.50	950	.60	2220	.70	4120	.80	6780
.50	190	.60	1040	.70	2360	.80	4330	.90	7050
.60	250	.70	1140	.80	2510	.90	4550	7.00	7330
.70	320	.80	1240	.90	2670	6.00	4780		
.80	390	.90	1350	5.00	2830	.10	5010		
.90	460	4.00	1460	.10	3000	.20	5250		
3.00	530	.10	1580	.20	3170	.30	5490		

DAILY MEAN GAGE HEIGHTS AND DISCHARGES OF SLIPPERY ROCK CREEK, AT WURTEMBURG, LAWRENCE COUNTY, PA.

1913.	JAN.		FEB.		MARCH.		APRIL.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
DAY.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.	G H	Dis.
1, ...	4.08	1560	3.71	1150	4.92	2700	3.85	1300	2.70	320	2.63	271	2.30	80	2.56	226	2.32	90	2.69	313	2.71	327	2.92	474
2.	3.40	860	3.11	618	4.37	1910	3.47	923	2.66	292	2.56	226	2.35	105	2.42	142	2.17	41	2.76	352	2.68	306	2.97	509
3, ...	3.27	746	3.12	626	3.71	1150	3.59	1030	2.62	264	2.51	196	2.34	100	2.34	100	2.27	71	2.79	383	2.58	238	2.99	523
4, ...	3.25	730	3.04	562	3.60	1040	3.45	905	2.54	214	2.45	160	2.28	74	2.35	105	2.29	77	2.63	271	2.54	214	2.93	481
5, ...	3.22	706	2.97	509	3.64	1080	3.63	1070	2.52	202	2.39	125	2.72	334	2.32	90	2.18	46	2.45	160	2.48	178	2.87	439
6, ...	3.64	1080	2.97	509	3.53	977	3.40	860	2.51	196	2.35	105	3.25	730	2.32	90	2.23	59	2.38	120	2.48	178	2.85	425
7, ...	5.52	3760	3.01	538	3.12	626	3.13	634	2.49	184	2.35	105	3.04	562	2.32	90	2.18	46	2.22	56	2.39	125	2.86	432
8, ...	7.79	*9650	2.98	516	3.17	666	3.01	538	2.48	178	2.35	105	2.81	397	2.28	74	2.31	85	2.23	59	2.44	154	3.18	674
9, ...	6.75	6640	2.95	495	3.22	706	2.91	467	2.46	166	2.32	90	2.72	331	2.23	59	2.22	56	2.27	71	2.74	348	3.11	618
10, ...	4.80	2510	2.93	481	3.74	1180	2.84	418	2.43	148	2.28	74	3.08	591	2.26	68	2.18	46	2.23	59	3.10	610	2.98	516
11, ...	5.38	3490	2.81	397	4.06	1530	3.10	610	2.42	142	2.28	74	3.35	815	2.58	238	2.17	44	2.21	53	3.26	738	2.97	509
12, ...	6.93	7130	2.87	439	3.92	1370	3.33	797	2.40	130	2.29	77	2.85	425	2.92	474	2.20	50	2.31	85	3.32	788	2.97	509
13, ...	5.79	4310	2.86	432	3.69	1130	3.03	554	2.42	142	2.27	71	2.70	320	2.63	271	2.37	115	2.34	100	3.79	1230	3.01	538
14, ...	4.64	2280	2.89	453	4.22	1720	3.67	1110	2.42	142	2.27	71	2.58	238	2.48	178	2.22	56	2.30	80	5.86	4460	3.13	634
15, ...	4.08	1560	2.78	376	4.28	1800	3.75	1190	2.52	202	2.26	68	2.50	190	2.30	80	2.18	46	2.24	62	5.74	4200	3.07	586
16, ...	3.94	1390	2.77	369	3.86	1310	3.31	779	2.54	214	2.27	71	2.45	169	2.27	71	2.24	62	2.32	90	4.78	2480	3.13	634
17, ...	5.70	4120	2.78	376	3.48	932	3.07	586	2.54	214	2.25	65	2.82	404	2.24	62	2.20	50	2.25	65	4.21	1710	2.95	495
18, ...	5.72	4160	2.86	432	3.26	738	2.89	453	2.49	184	2.29	77	2.57	232	2.30	80	2.20	50	2.21	53	3.85	1300	2.92	474
19, ...	4.91	2690	2.77	369	3.14	642	2.79	383	2.41	136	2.22	56	2.48	178	2.26	68	2.22	56	2.38	120	3.69	1130	2.85	425
20, ...	4.42	1980	3.01	538	3.06	578	2.72	334	2.38	120	2.31	85	2.42	142	2.26	68	2.25	65	2.39	125	3.68	1120	2.85	425
21, ...	5.68	2970	3.18	674	2.97	509	2.65	285	2.36	110	2.55	220	2.39	125	2.22	56	2.26	68	2.52	202	3.56	1000	2.83	411
22, ...	4.62	2250	3.58	1020	2.90	460	2.65	285	2.38	120	2.46	166	2.32	90	2.28	74	2.40	130	2.55	220	3.34	806	2.68	306
23, ...	4.88	2640	4.25	1760	2.86	432	2.61	257	2.54	214	2.37	115	2.36	110	2.38	120	2.36	110	2.57	232	3.24	722	2.87	439
24, ...	5.58	3870	3.54	986	4.42	1980	2.61	257	2.56	226	2.41	136	2.50	190	2.28	74	2.35	105	2.71	327	3.20	690	3.13	634
25, ...	4.80	2510	3.19	682	9.41	*15200	2.57	232	2.54	214	2.33	95	2.70	320	2.30	80	2.22	56	3.07	586	3.09	602	3.27	746
26, ...	4.23	1740	3.02	546	a9.80	*16700	2.55	220	2.45	160	2.50	190	2.72	334	2.22	56	2.24	62	3.41	869	2.99	523	3.25	730
27, ...	3.83	1270	3.69	1130	8.78	*12800	2.75	355	2.57	232	2.52	202	2.56	226	2.29	77	2.20	50	3.17	666	2.95	495	3.27	746
28, ...	3.46	914	5.55	3820	6.70	6510	3.21	698	4.11	1590	2.51	196	2.52	202	2.22	56	2.27	71	2.95	495	2.91	467	3.53	977
29.	3.28	754	....	......	5.02	2860	3.25	730	3.44	896	2.34	100	2.64	278	2.23	59	2.28	74	2.81	425	2.94	488	3.48	932
30, ...	3.18	674	....	......	4.35	1880	3.03	554	2.82	404	2.30	80	3.00	530	2.22	56	2.42	142	2.69	313	2.96	502	3.27	746
31, ...	3.46	914	....	......	3.98	1440	....	......	2.78	376	....	......	2.78	376	2.22	56	....	......	2.77	369	......	......	3.24	722

Note.—a=Max. 10.21′ at 7.30 A. M.=17800 sec. ft. *Estimated.

ESTIMATED MONTHLY DISCHARGE OF SLIPPERY ROCK CREEK, AT WURTEMBURG, LAWRENCE COUNTY, PA.

(Drainage area 400 square miles.)

MONTH.	Discharge in Second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1913.					
January,	9650	674	2640	6.600	7.609
February,	3820	369	743	1.858	1.935
March,	17800	432	2730	6.825	7.868
April,	1300	220	627	1.568	1.750
May,	1590	110	269	0.672	0.744
June,	271	56	122	0.305	0.340
July,	815	74	297	0.742	0.855
August,	474	56	110	0.275	0.317
September,	142	44	67	0.168	0.188
October,	869	53	238	0.595	0.686
November,	4460	125	938	2.345	2.616
December,	977	306	571	1.428	1.647
The year,	17800	44	779	1.948	26.555

MISCELLANEOUS DISCHARGE MEASUREMENTS MADE DURING 1913.

Stream.	Location.	Date.	Drainage area above point.	Gage height.	Total discharge.	Discharge per sq. mile Trib. drainage area.	Remarks.
Bennett Branch of Sinnemahoning creek.	Benezette, Elk Co., ...	Aug. 19, 1913, ...	220	....	50	0.227	Surface msmt. referenced.
Chillisquaque creek, ...	Pottsgrove, Northumberland Co.,	Aug. 18, 1913.	81	....	1.21	0.015	Wading msmt. at 2nd highway bridge above mouth. Referenced.
Kettle creek, ...	Westport, Clinton Co., ...	Sept. 29, 1913, ...	240	....	22	0.092	At highway bridge near mouth.
Kettle creek, ...	Above Westport, Clinton Co., ...	Sept. 30, 1913, ...	220	1.14	21	0.095	At 2nd highway bridge above mouth.
Kettle creek, ...	Above Westport, Clinton Co., ...	Nov. 6, 1913, ...	220	2.09	248	1.127	At 2nd highway bridge above mouth.
Little Pine creek, ...	Waterville, Lycoming Co., ...	Sept. 11, 1913, ...	171	....	7.2	0.042	Wading msmt. at mouth.
Lycoming creek, ...	Bridge No. 2, near Williamsport, Lycoming Co.	Sept. 12, 1913, ...	268	2.02	13	0.048	Wading msmt. below bridge No. 2.
Lycoming creek, ...	Bridge No. 2, near Williamsport, Lycoming Co.	Nov. 5, 1913, ...	268	2.60	205	0.765	From bridge No. 2.
Lycoming creek, ...	Bridge No. 2, near Williamsport, Lycoming Co.	Nov. 11, 1913, ...	268	2.97	732	2.731	From bridge No. 2.

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